AMERICAN JOURNAL OF ORTHODONTICS

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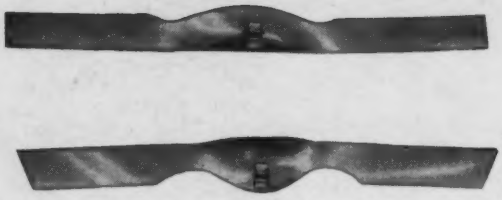
developed especially for the "EDGEWISE TECHNIC"



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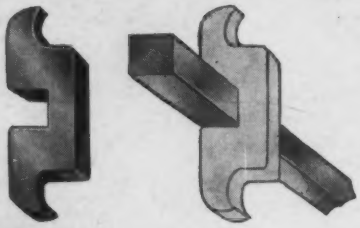

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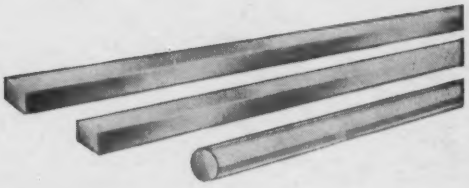

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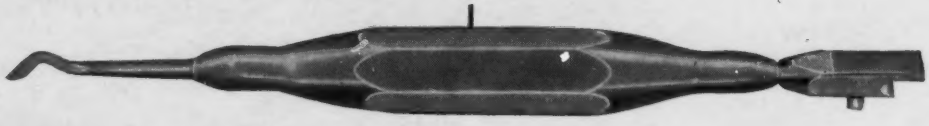

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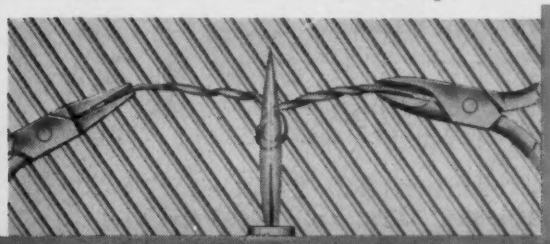

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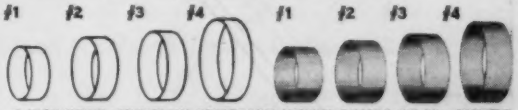

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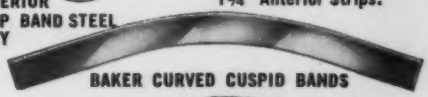

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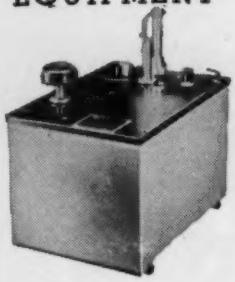

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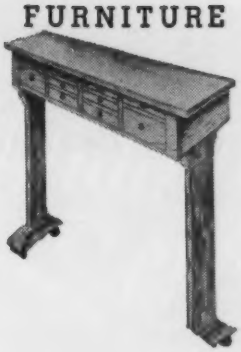

OPERATING AIDS

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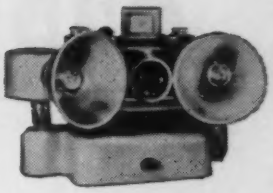

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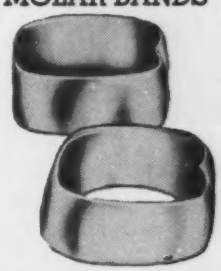
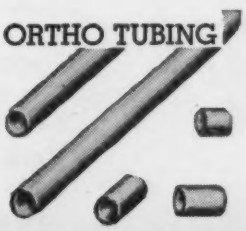


ORTHO TUBING



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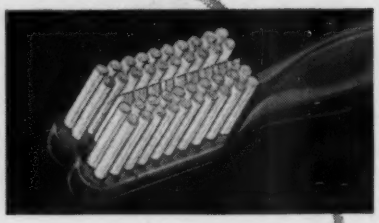

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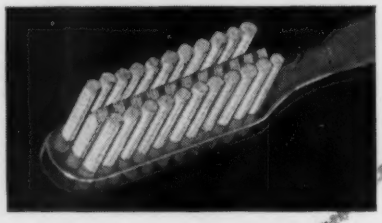

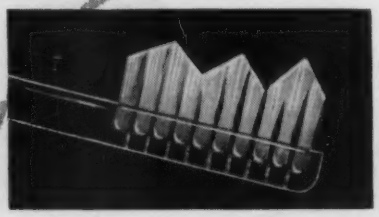

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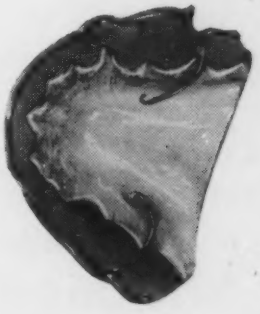

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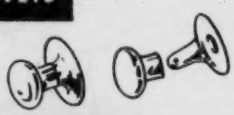

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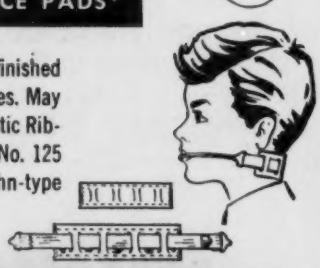

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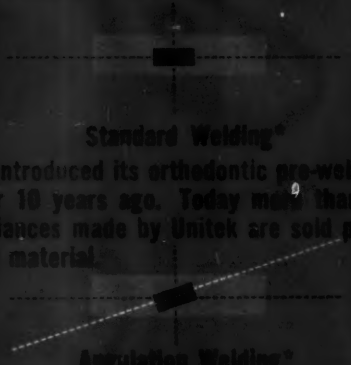

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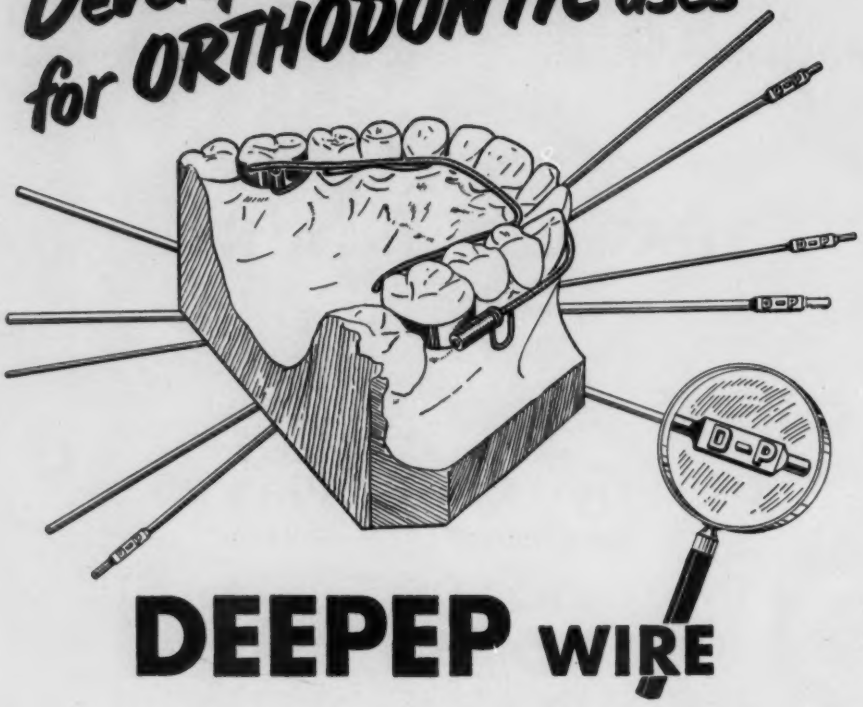

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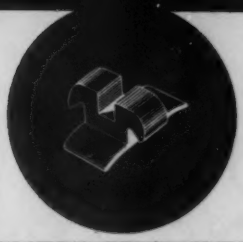

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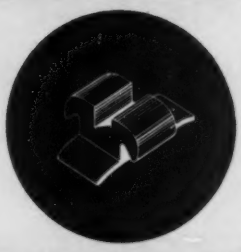

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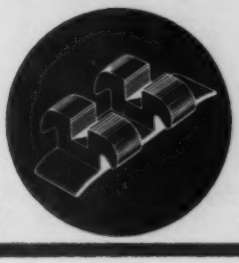

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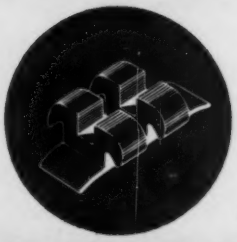

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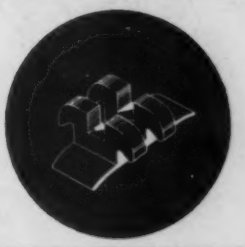

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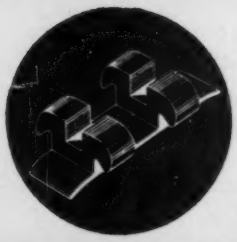

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Original Articles

THE RELATIONSHIP OF DENTOFACIAL GROWTH AND SKELETAL MATURATION TO MALOCCLUSION

LEONARD J. SEIDE, B.A., D.D.S., RIVERDALE, N. Y.

INTRODUCTION

THE orthodontist, if he is to evaluate properly the role he plays in correcting malocclusion, must have the opportunity to examine the conditions over which he has the least control, namely, growth and development during correction of the malocclusion. "Growth manifests itself by an increase in mass and volume as disclosed by an increase in weight and by changes in external dimensions as the child advances in age; development is the expression of those processes by means of which it becomes progressively more mature. While growth and development proceed concomitantly in the normal child they are to some degree potentially independent processes."[6]

Fortunately, the roentgenogram is a tool which the clinician can use to assess the effects of his treatment as recorded in the form of roentgenographic cephalometry. It has been noted by Sassouni,[13] however, that one of the major difficulties in the assessment of the effects of treatment is the simultaneous presence of growth and that the role of facial growth is still in a controversial state. There is uncertainty of predicting the direction and amount of growth within an individual. Hence, we must look for other facets of growth, particularly skeletal maturation, if we are to understand properly the effects of orthodontic treatment and the future appraisal of the problems of malocclusion. Thus, an evaluation of treated cases is in order in the areas which the clinician is least likely to control, namely, dentofacial growth and skeletal maturation.

This article, which is a digest of a thesis given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood that it does not necessarily represent or express the opinion of the Board.

MATERIALS AND METHODS

Various types of malocclusion were selected on the basis of diversity of skeletal age as compared to the chronological age in each case. In one of the cases evaluated correction of the malocclusion had been completed, and one case is currently under treatment. In each case a thorough history was obtained,

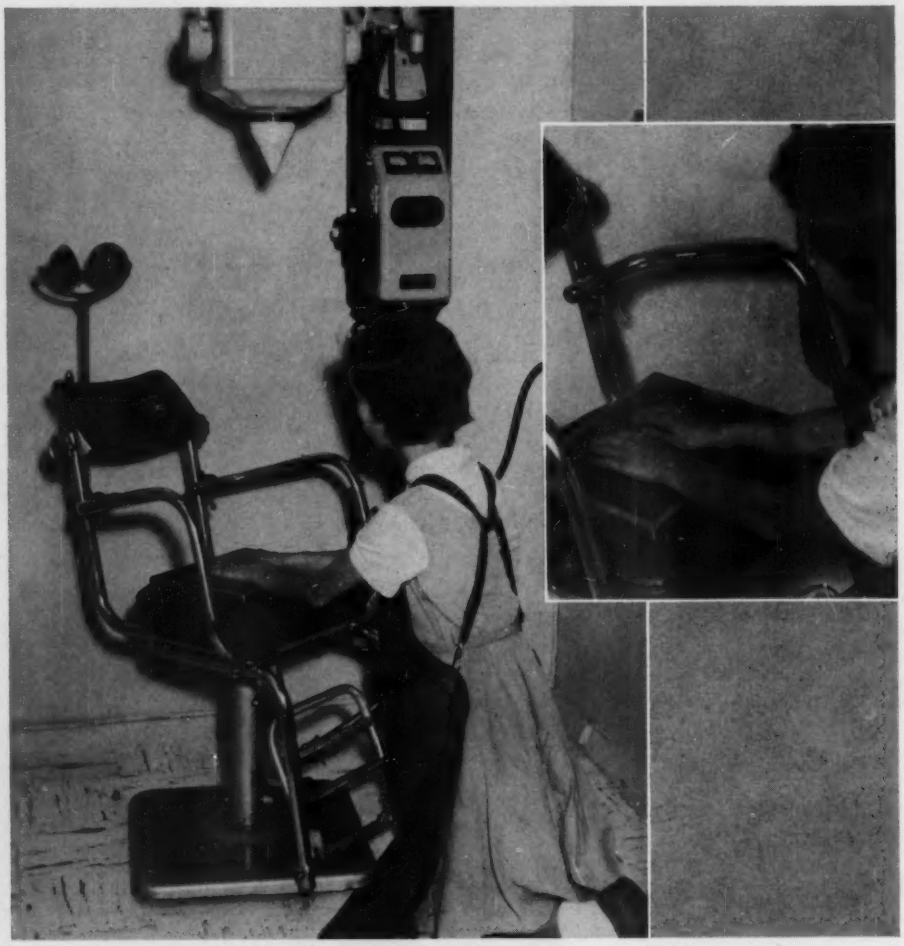


Fig. 1.—Method of positioning patient and dental x-ray tube for obtaining a hand-wrist roentgenogram for use in the assessment of skeletal maturation of the hand and wrist. An 8 × 10 inch film, with high-speed screens mounted in a cassette, was used. The film-target distance was 36 inches, and the exposure time was ¼ to ½ second, depending upon the age of the child. The x-ray machine was operated at 10 Ma. and 110 volts. The patient was draped in a 0.5 mm. lead apron, and the tube of the x-ray machine had a 1 mm. aluminum filter inserted as a protection against secondary radiation.

including information elicited after consultation with the patient's physician regarding the medical history. In all cases a full series of intraoral, hand and wrist, lateral jaw, and cephalometric roentgenograms were taken, and gnathostatic casts and full-face, profile, and intraoral photographs were also obtained serially.

Method of Assessment of Skeletal Maturation: Carpal Index.—According to Acheson,[1] the hand, including the wrist, has received a considerable amount

of attention in the literature, because of its availability for radiography and its suitability for study due to its wide range of bones. The work of Rotch[16] (1900-1908), Flory[2] (1936), Todd[17] (1937), and Greulich and Pyle[6] (1950) suggests that this region offers a fair index of the maturity of the entire skeleton of the healthy child.

The hand-wrist roentgenogram was the criterion of assessment for skeletal maturation of the cases in this study. It was felt that a more convenient, rapid, and precise method was needed, a method which would provide more information about the developmental status of the child than could properly be inferred from weight and age alone. Greulich[6] has stated that the bones of the hand and wrist, like those of the rest of the body, appear to have a certain individuality. This is seen in the constant order in which the carpals and the epiphyses begin to ossify and in the regular sequence in which the latter fuse with their shafts. These processes occur with great regularity in children who are in good health, and the order in which they occur is probably determined genetically. The roentgenograms of the hand and wrist were taken when treatment was started and again when treatment was concluded. In Case 1 the hand and wrist roentgenograms were taken periodically during treatment.

As indicated in Fig. 2, there is an over-all average time of appearance of the ossification centers of the carpals and epiphyses which was accepted in this analysis.

Maturity indicators: The method of assessing the posteroanterior hand-wrist roentgenograms used in this study relative to the skeletal maturity of each case was a comparative one employing the skeletal age standards found in the Greulich and Pyle's[5] *Radiographic Atlas of Skeletal Development of the Hand and Wrist.* The textbook used the so-called "maturity indicators" (Fig. 3) or the silhouettes of the various developing ossification centers as seen in the routine hand film for establishing the skeletal age standards. The changes in the form of these centers serve to distinguish the developmental stages as the child matures skeletally.

According to Greulich and Pyle,[5] the rate at which skeletal development proceeds is distinctly more rapid in girls than in boys. In girls the relative precocity of the skeletal development is already apparent at 3 months of age, and it becomes more pronounced as they grow. A comparison of male and female standards shows that the skeletal status of 13½-year-old girls was not equaled by the boys of the same age group until they were 15½ years of age. Hence, separate male and female skeletal age standards were used in this study. Furthermore, prolonged nutritional inadequacies, precocious puberty, hypogenital status, and febrile and other severe illnesses greatly affect the development of the ossification centers in the hand and wrist. These factors were taken into account in the evaluation of the skeletal age of the cases in this study. Greulich[6] has stated that in most normal children there is a sufficiently good balance in osseous development to permit one to assign to the hand a single

skeletal age which describes adequately the status of the bones which compose it. Thus, the various wrist roentgenograms in this study were assigned skeletal ages according to the skeletal age standards that they most nearly resembled as found in the *Radiographic Atlas of Skeletal Development of the Hand and Wrist.*

Significant deviation from the normal: Salzmann[12] has noted that if the child is otherwise normal in development and growth, deviations from the normal carpal index may be assumed to belong within the range of individual normal.

Fig. 2.—The carpals and the epiphyses of the hand and wrist with the average time of appearance and fusion of the ossification centers of boys and girls (Scammon). (From Salzmann: *Orthodontics: Practices and Techniques*, J. B. Lippincott Company, p. 63.)

He further states that it should be remembered that there is a wide range of variation within the normal limits of carpal ossification as well as differences between the sexes. What was considered in the cases studied was the significant deviation from the normal of the skeletal age in each case. The amount of deviation was arrived at from tables of means and standard deviations of both sexes listed in the *Radiographic Atlas of Skeletal Development of the Hand and Wrist,* and each case was judged according to its advanced or retarded skeletal age.

Method of Dentofacial Growth Appraisal: Serial Roentgenographic Cephalometry.—The problem of assessing dentofacial growth is difficult with respect to determining what actually did occur during the period of study of the chosen cases. The assessment of dentofacial growth is not so accurate or convenient, unfortunately, as the skeletal maturation demonstrated in the previous

Fig. 3.—The maturity indicators. The individual carpals and epiphyses numbered approximately in the order in which their ossification begins. Irregularities in the order of appearance are most likely to occur in those centers indicated by asterisks(*).

1, Capitate; *2*, hamate; *3*, distal epiphysis of the radius; *4*, *epiphysis of proximal phalanx of the third digit; *5*, *epiphysis of proximal phalanx of the second digit; *6*, *epiphysis of proximal phalanx of the fourth digit; *7*, epiphysis of the second metacarpal; *8*, epiphysis of distal phalanx of the first digit; *9*, epiphysis of the third metacarpal; *10*, epiphysis of the fourth metacarpal; *11*, epiphysis of proximal phalanx of the fifth digit; *12*, epiphysis of middle phalanx of the third digit; *13*, epiphysis of middle phalanx of the fourth digit; *14*, epiphysis of the fifth metacarpal; *15*, epiphysis of middle phalanx of the second digit; *16*, triquetral; *17*, epiphysis of distal phalanx of the third digit; *18*, epiphysis of distal phalanx of the fourth digit; *19*, epiphysis of the first metacarpal; *20*, *epiphysis of proximal phalanx of the first digit; *21*, epiphysis of distal phalanx of the fifth digit; *23*, *epiphysis of middle phalanx of the fifth digit; *24*, *lunate; *25*, greater multangular; *26*, *lesser multangular; *27*, *navicular; *28*, distal epiphysis of the ulna; *29*, pisiform; *30*, sesamoid of adductor pollicis (the sesamoid of flexor pollicis brevis is visible through the head of the first metacarpal, just below the numeral 2 on the epiphysis of the proximal phalanx of the thumb).

(From Greulich and Pyle: *Radiographic Atlas of Skeletal Development of the Hand and Wrist*, Stanford University Press, p. 187.)

section utilizing the carpals and epiphyses of the hand and wrist. It was not possible, as with the carpals, to determine the individuality of growth of the facial bones, and a timetable for the development of the bones that make up the dentofacial area would not be as applicable as in the carpal area. What is very often demonstrable in cases of malocclusion is the constant disorder and irregularity of growth and development, rather than order and regularity, as has been noted in the section dealing with skeletal maturation. However, Krogman[9] has noted that a growth analysis in orthodontics yields valuable background understanding of the patient as well as a certain amount of more precise knowledge concerning the face and teeth.

A serial roentgenographic cephalometric analysis was employed in this study to illustrate, in an over-all manner, the general growth trends in the dentofacial area. In each case studied, an attempt was made to correlate the degree of skeletal maturation and dentofacial growth, respectively.

Lateral cephalometric headplates were used serially in this study, with composite tracings made and evaluated on films taken before and after treatment.

The sella-nasion line was employed in this study as a reference line with sella registered, as it was felt that sella was more or less stable. Krogman and Sassouni[8] have indicated that sella-nasion has been used by many (Schuller, Broadbent, Brodie, and Bjork), mostly with sella registered.

In order to record and interpret properly the dentofacial changes which were least influenced by treatment in each case, it was decided to use parts of various growth analyses found in the literature[3, 7, 10, 11] which would be applicable to a dentofacial growth and development study. A table of means was compiled from the means published in the various analyses (Table I).

Graber[3] has noted, in a brief survey of cephalometric criteria, that there was present one strong, continuous thread—the attempt to construct a norm or standard on which to base our case analyses. He adds that the need for such a standard and for therapeutic goals cannot be challenged; however, the actual creation of this norm concept has been most difficult and fraught with the pitfalls of mathematic expression of morphologic and physiologic variance.

In the cases studied the dentofacial growth appraisal did not attempt to compare the proximity of the many angular findings as a result of treatment with the mean or norm, as indicated in Table I, as therapeutic goals. In this study the dentofacial growth appraisal, like the assessment of skeletal maturation, attempted merely to show any changes in the standard deviation from the mean as changes caused by dentofacial growth and development and not as changes caused by treatment.

Method of Correlation Between Skeletal Maturation and Dentofacial Growth and Development.—The changes noted in skeletal maturation and dentofacial development over the entire period of this study were evaluated. The significant changes in skeletal maturation as opposed to the aforementioned general tendency of dentofacial growth and development were then correlated. During the forty-six months that Case 1 was followed, for example, where an

TABLE I. TABLE OF MEANS

SKELETAL PLANES AND LANDMARKS	CHILDREN 8-11 (YRS.) MEAN	CHILDREN 8-11 (YRS.) STANDARD DEVIATION	ADULTS (OVER 18) MEAN	ADULTS (OVER 18) STANDARD DEVIATION	REFERENCE
1. Relative anteroposterior position of maxilla S-N-A	80.79	3.85	82.01	3.89	
2. Relative anteroposterior position of mandible S-N-B	78.02	3.06	79.97	3.60	
3. Relation of maxillary to mandibular differences S-N-A S-N-B	+2.77	2.33	+2.04	1.81	Riedel[11]
4. Mandibular plane to sella-nasion plane NS-Go-Gn	32.27	4.67	31.71	5.19	
5. Angle of convexity NAP	+4.22	5.38	+1.62	4.78	
6. Relation of denture bases to each other and to facial profile N-P-A-B	4.6	3.06			Graber[3]

SKELETAL PLANES AND LANDMARKS	AGE (YEARS)	BOYS MEAN	BOYS S. D.	BOYS RANGE	GIRLS MEAN	GIRLS S. D.	GIRLS RANGE	REFERENCE
7. S angle (junction of y-axis and sella-nasion plane) extent and forward direction of facial growth	4	66.6	3.0	62-71	68.1	3.2	61.0-76.5	
	8	67.1	3.0	61.5-73	69.5	3.8	63-84.0	Higley[7]
8. Gonial angle	4	128	4.5	118-137	128.8	4.5	121-141	
	8	127.2	4.7	120-134.5	128.7	5.7	115-139	

SKELETAL PLANES AND LANDMARKS	MAXILLOFACIAL TRIANGLE CHILDREN 6-19 YEARS MEAN	REFERENCE
9. Angle N (cranial-facial), anterior developmental limit of body of mandible at mental protuberance	76.6	
10. Angle M (facial mandibular) proportional, or vertical growth and development of mandible	67.7	Margolis[10]
11. Angle X (cranial mandibular) relative vertical growth and development of mandible	35.7	

unfavorable downward and backward direction of dentofacial growth and development was noted, there was likewise a constancy of skeletal retardation at two standard deviations below the mean throughout the entire period.

Two malocclusion cases will be examined, each from the standpoint of varied skeletal maturation and dentofacial growth and development. Upon examination, the first case indicated skeletal retardation and the second case showed skeletal advancement.

CASE 1.—Patient B. S., a boy born in the United States, was 10.0 years of age when first examined. His parents were of medium stature. There were no siblings. The mother had a healthy pregnancy as well as a full-term normal delivery. The patient's birth weight was 7 pounds, 12 ounces. The patient was bottle fed. He began to walk and talk at approximately 11 months of age. Measles and chickenpox were the only contagious diseases contracted to date. The boy's childhood was a healthy one, unmarked by nutritional deficiency, endocrinopathy, or severe febrile illnesses. The general health at the time of examination was good. The eruption of the deciduous dentition began at 4½ months, and his permanent teeth began to erupt when he was 6 years old. The occlusion was Class II, Division 2 (Angle) with the maxillary right and left first molars and right and left lateral incisors in lingual occlusion. There was no history of oral habits at the time of examination.

Fig. 4.—Patient B. S. Chronological age, 10.0 years. Male standard: age 10 years.

Skeletal Assessment (Bone Age-Wrist).—The male standards for age 10.0 years (Fig. 4) show the triquetral, lunate, and navicular bones about equal in size. Overlapping of carpal shadows is observed with preparation for epiphysial union. There is a definite D-shaped appearance to the epiphyses of the metacarpals. The ulnar epiphysis is well developed for this age. The navicular and the greater and lesser multangular bones have begun formation of various indentations and volar margins preparatory to articulation with the metacarpals and with the radial epiphysis. The epiphysis of the metacarpal of the thumb is almost as wide as its shaft.

Bone age at 10.0 years: The hand-wrist roentgenogram of Patient B. S. at the age of 10.0 years (Fig. 4) is similar to the male standards for 9 years rather than 10 years for the following reasons:

1. The epiphysis of the ulna has not begun ossification.
2. There is some roundness rather than D-shaped outlines in the metacarpal epiphysis.
3. There is no distinct indentation of the center of the greater multangular which will eventually articulate with the metacarpal of the thumb. There is also absence of flattening of its navicular surface.
4. An indentation of the proximal margin of the epiphysis of the thumb is not present. This epiphysis is not as wide as its shaft.

Despite the lack of appearance of the ulnar epiphysis which usually ossifies in boys at the age of about 7 or 8 years (Fig. 2), the over-all skeletal age of the individual bones is nevertheless 9.0 years. The skeletal maturation of this patient is slow.

Bone age at 11.0 years: The hand-wrist roentgenograms for Patient B. S. at the age of 11.0 years now indicates that there has been further skeletal maturation of the carpals and the epiphyses with their shafts:

1. The epiphysis of the ulna is now more distinct although very small for this age.
2. The triquetral, lunate, and navicular carpals are now equal in size.
3. There is further overlapping of the carpal shadows, but it is not pronounced, although these bones have not begun to fill the open spaces nor assumed their adult sizes or shapes.
4. The metacarpal articular surfaces of the capitate are beginning to differentiate.
5. Further indentation of the proximal margin and widening of the epiphysis of the first metacarpal has taken place and the epiphysis is now almost as wide as its shaft.
6. There is still further flattening of the navicular surface of the greater multangular.

The wrist roentgenogram of this patient indicates a skeletal retardation age of 10.0 years.

Bone age at 13 years 10 months: The male standards for the age of 13 years 3 months indicates preparation for epiphysial union, as well as the formation of styloid process and the radial beak of both the ulnar and radial epiphyses. The complete outlines of the hamulus of the hamate can be seen; navicular shapes further to the navicular articular surfaces of the epiphyses of the radius, capitate, and the multangulars. The epiphyses of the second, third, fourth, and fifth metacarpals and the proximal phalangeal epiphyses of the thumb and fourth and fifth fingers are now as wide as their shafts. The distal phalangeal epiphyses of the second and fourth fingers have begun to "cap" their shafts.

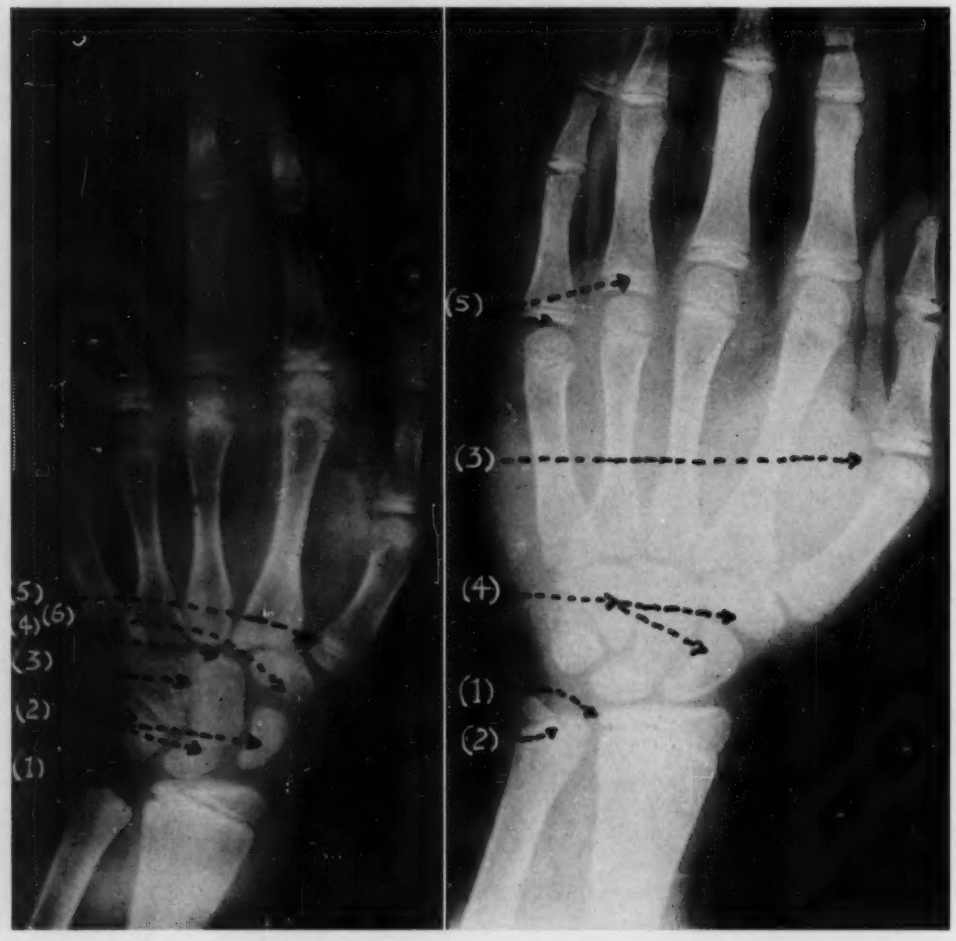
Ossification has also begun in the adductor sesamoid of the thumb.

The hand-wrist roentgenogram of Patient B. S. at the age of 13 years 10 months (Fig. 5) is comparable to the standard for 12 years 6 months since:

1. The radial and ulnar epiphysis appear to stand apart and show no signs of preparation for union.
2. The two centers of ossification of the ulnar epiphysis have recently united. There is absence of the styloid process of the ulnar epiphysis and radial beak on the ulnar side of the radial epiphysis.
3. The adductor sesamoid which appears on the distal end of the first metacarpal, between the metacarpal and the epiphysis, is absent.
4. The completion of the adult outlines and articular surfaces of the hamate, navicular, and the multangulars has not taken place. Preparation for epiphysial union of the second, third, fourth, and fifth metacarpals is not evident, as these epiphyses are not quite as wide as their shafts.

5. The proximal phalangeal epiphyses of the thumb and fourth and fifth fingers and the distal phalangeal epiphyses of the second and fourth fingers have not begun to "cap" their shafts.

This wrist roentgenogram clearly indicates that the radial and ulnar epiphyses not only stand apart but show no evidence of styloid process or beak formation on either the ulnar or the radial epiphyses. The growth appears to be similar to the male standards indicated at 12.6 years, indicating a definite skeletal retardation.



A. *B.*

Fig. 5.—Patient B. S. *A*, At age 11.0 years. *B*, At age 13 years 10 months.

Significant Deviation From the Normal.—In the skeletal assessment of Patient B. S. there appears to have been a constant retardation of two standard deviations below the mean throughout the forty-six-month period of study. The absence of endocrinopathy, hypogenitalia, or nutritional inadequacy leads one to suspect that, from a genetic standpoint, this is a slowly maturing youngster.

Cephalometric Analysis.—The general tendency for dentofacial growth (Fig. 6) appears to be in an unfavorable downward and backward direction over a forty-six-month period of study. The apical base (AB) difference originally was two standard deviations; it increased a year later to almost three standard deviations, and then returned to two standard deviations some thirty months later. The angle of convexity (NAP) and the relationship of the denture

bases to each other and to the facial profile (NPAB) originally was quite steep at almost three standard deviations, decreasing to two standard deviations during the forty-six-month period. The unfavorable facial growth and development pattern was also indicated in the poor relationship of the mandibular plane to the cranial base (NSGOGN), which was originally quite steep (three standard deviations). It increased a year later to within four standard deviations, returning to the original three standard deviations some thirty months later. The downward and backward extent of dentofacial bone growth was also indicated in the S angle, which was not within the normal range and which far exceeded the mean as indicated in Table I.

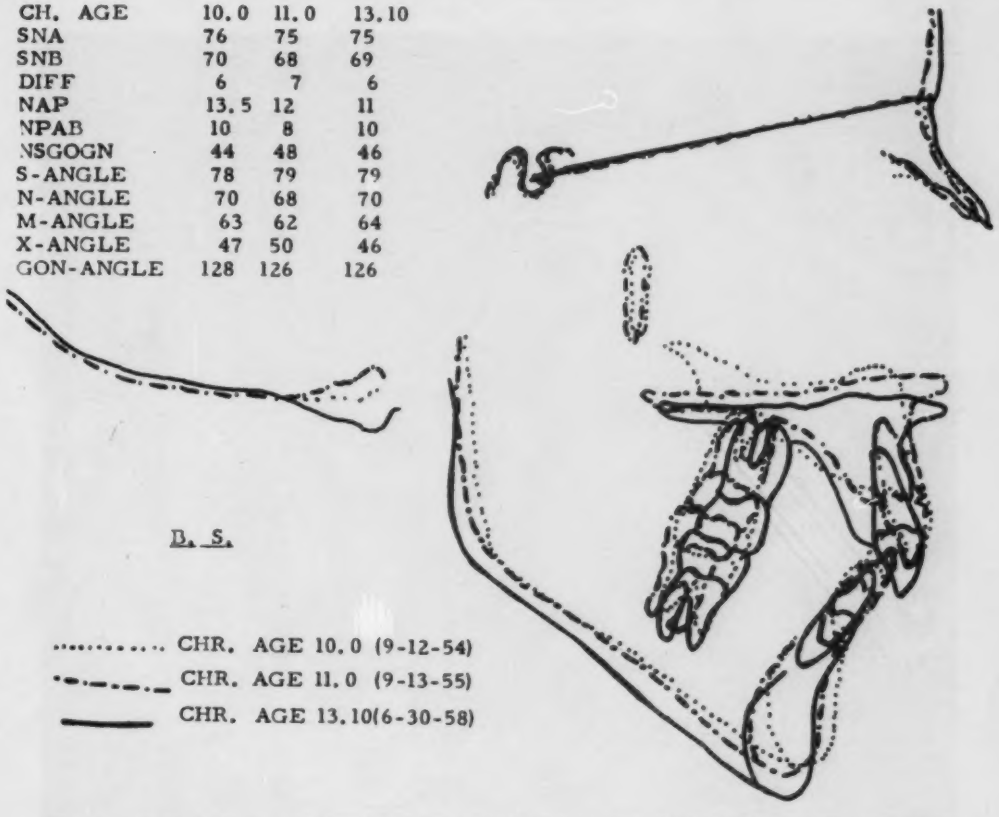


Fig. 6.—Patient B. S. Serial cephalometric tracings for dentofacial growth appraisal.

The maxillofacial triangle (Margolis) indicated the retruded position of the body of the mandible to the cranial base throughout the period studied, as well as the similarly very poor relative vertical growth and development of the mandible, since a line tangent to the mandibular plane entered the cranial vault throughout the entire period of study.

Correlation Between Skeletal Age and Dentofacial Growth and Development.—There has been a consistency of retarded skeletal maturation and unfavorable dentofacial growth and development. Similarly, the rate of eruption of the permanent teeth was very slow. An insufficiency of arch length was also noted. Treatment was delayed one year in view of the retarded skeletal maturation. The findings indicate a slowly maturing youngster without any signs of a preadolescent growth spurt. No endocrinopathy or other causative condition was revealed in the history.

Conclusion.—The unfavorable dentofacial growth has not aided the correction of the malocclusion. In the final evaluation of this patient there appears to be a correlation between

the retarded skeletal maturation and the facial bone growth. Dentofacial growth is in an unfavorable downward and backward direction, with the first molars in a more forward and downward position and the incisors in a more downward and backward position.

CASE 2.—Patient S. B., a girl born in the United States, was 10.0 years when first examined. Her parents were short in stature. There was one sibling, 12.2 years of age. The mother had a healthy pregnancy and a full-term normal delivery. The patient's birth weight was 7 pounds, 6 ounces. The patient was bottle fed for eighteen months and began to walk and talk at 1 year. Measles and chickenpox were the only contagious diseases contracted to date. The patient's childhood was a healthy one unmarked by nutritional

A. *B.*

Fig. 7.—Patient S. B. *A*, At age 10.0 years. *B*, At age 13.10 years.

deficiency, endocrinopathy, or severe febrile illnesses. The general health upon the time of examination was good. The eruption of the deciduous teeth began at 6 months, and the permanent teeth began to erupt at 5½ years. The occlusion was Class I (Angle) with a severe open-bite. There was a reverse curve of Spee in the maxilla. Pronounced tongue-thrusting and mentalis were the oral habits present at the time of examination.

Skeletal Assessment (Bone Age-Wrist).—The female standard for the age of 10.0 years indicates that the carpal bones have reached their adult forms with reciprocal shaping of

these bones along their articular surfaces; the epiphyses of the metacarpals are well defined and D-shaped instead of round; there is quite common overlapping of the carpal bone shadows.

Bone age at 10.0 years: The hand-wrist roentgenogram of Patient S. B. at the age of 10.0 years (Fig. 7) is comparable to the standard for 11 years rather than for 10 years for the following reasons:

1. The carpal area is full and shadows overlap in several directions.
2. Epiphysial gaps are quite reduced.
3. The ulnar beak of the radial epiphysis is quite pronounced but rounded at its ulnar side.
4. All bones have their adult shape.
5. The pisiform is quite large.
6. The epiphysis on metacarpal I is in contact along its outer edge with its shaft.
7. The ulnar epiphysis is shaping to the adjacent surface of the radius and to the radial portion of the end of its own shaft.
8. The adductor and flexor sesamoids of the thumb have begun to ossify.

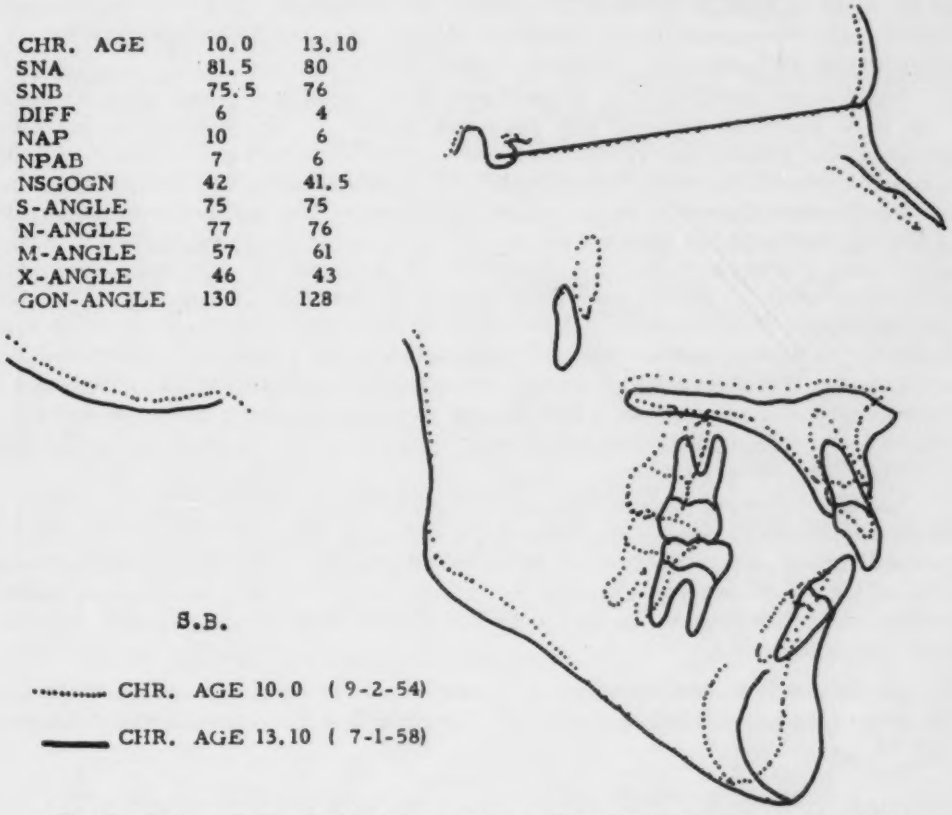


Fig. 8.—Patient S. B. Cephalometric tracings for dentofacial growth appraisal.

The skeletal age of this patient is 11 years. The patient has an advanced skeletal maturation.

Bone age at 13.10 years: The female standards for 13.6 years indicate that fusion of the epiphysis of the thumb is well under way. Fusion has also begun in the proximal epiphyses of the third, fourth, and fifth fingers, with quite a reduction in the epiphysial cartilage of the proximal phalanx of the second finger. The epiphyses of all the distal phalanges are now fused with their shafts.

The hand-wrist roentgenogram of Patient S. B. at the age of 13.10 years is comparable to the standard for 15.0 years rather than for 13.6 years for the following reasons:

1. All epiphyses except the radius and ulnar epiphyses have fused. Some of the epiphyses show recent union, with some gaps at the extreme outer edge.
2. Union is almost completed between the ulnar epiphysis and its shaft.
3. Both radial and ulnar epiphyses have begun to turn down about the edges of their respective shafts.
4. Fusion is completed in the second, third, fourth, and fifth metacarpals and in all the proximal phalanges, and the lines of fusion are almost entirely obliterated.

(*Note:* Epiphysial fusion was completed first in the distal, next in the proximals, and last in the middle phalanges of the second, third, fourth, and fifth fingers.)

With the beginning of obliteration of the epiphysial lines, we can assign an advanced skeletal maturation age of 15.0 years to this patient.

Significant Deviation From the Normal.—In the skeletal assessment of Patient S. B. there appears to be a constant advanced skeletal maturation from within the mean to one and one-half standard deviations above the mean during the forty-six months this case was studied, which is considered normal in the skeletal development of girls. The absence of endocrinopathy, hypergenitalia, or precocious puberty leads one to suspect that this is an early maturing youngster with an advanced bone age.

Cephalometric Analysis.—The general tendency of dentofacial growth (Fig. 8) appears to be in a favorable forward and downward direction. The relative anteroposterior positions of the maxilla (SNA) and the mandible (SNB) to the cranial base were within the mean throughout the entire period studied. The apical base (AB) difference decreased from two standard deviations to one standard deviation. The angle of convexity (NAP) and the relationship of the denture bases to each other and to the facial profile (NPAB) remained within the standard deviation throughout the entire period. The relationship of the mandibular plane to the cranial base (NSGOGN) was at two standard deviations. The downward and forward direction of facial growth as recorded in the S angle was within the range, as indicated in Table I, and did not change during the entire period. The maxillofacial triangle indicated that there might have been some arrest in the proportional growth and development of the mandible, since a line tangent to the mandibular plane entered the vault throughout the entire period. The gonial angle remained within the mean during the forty-six months this case was studied.

Correlation Between Skeletal Age and Dentofacial Growth and Development.—There has been an acceleration in skeletal maturation together with a favorable downward and forward dentofacial growth during the forty-six-month period of study. This, coupled with the rapid closure of the severe open-bite some four months after a habit-breaker was inserted, indicates a positive correlation between the advanced skeletal maturation and the favorable dentofacial growth in this case.

Conclusion.—With elimination of the severe tongue-thrusting and mentalis habits, and aided by an advanced skeletal maturation and favorable dentofacial growth and development, a difficult malocclusion was resolved in eighteen months. There had been no relapse some twenty-eight months later. In the final evaluation of this case, the roles that dentofacial growth and development played toward resolving the open-bite were important and aided in obtaining a favorable result which was quite stable. The molars are in a more downward and forward position. The maxillary incisors are downward and somewhat forward, and the mandibular incisors are upward and forward. The bite is closed.

SUMMARY

In order properly to appraise the end result of corrected malocclusion, two treated cases were evaluated on the basis of degree of skeletal maturation and dentofacial growth and development.

Under consideration here were (1) a method of skeletal assessment using the hand-wrist roentgenogram and the carpal index and (2) a dentofacial growth analysis using the lateral cephalometric headplate together with a table of means.

The manner of obtaining hand-wrist roentgenograms was described. A brief outline of the carpals and the appearance of the ossification centers was presented. The maturity indicators of skeletal assessment were outlined, and significant deviations from the normal in skeletal maturation were evaluated.

In the dentofacial growth analyses the following were used:

1. Cephalometric tracings were employed to appraise the general tendency for growth and development.
2. Sella-nasion was used as a line of reference with sella registered.
3. A table of means was compiled from the various analyses in the literature; in this table the skeletal planes and landmarks which were pertinent to dentofacial growth and development and which would not be influenced by treatment were used.

Comparisons were then made with the table of means to evaluate significant deviations from the mean as a method of recording dentofacial growth. A correlation of the effects of skeletal maturation upon dentofacial growth and development was then attempted in the various cases used in this study.

Cases of varied malocclusion with differences in skeletal maturation at the time of original examination were investigated, leading to the conclusions that: (1) the proper assessment of skeletal maturation is a positive factor in dentofacial growth and development and cannot be separated from dentofacial growth; (2) the medical history, genetic background, nutritional history, and endocrinologic status of the patient influence both skeletal maturation and dentofacial growth and development and should be considered in any attempt to correct a malocclusion; and (3) ultimately, the prognosis in correction of malocclusion is directly related to the *significant* deviations from the means of both skeletal maturation and dentofacial growth, and therefore both should be considered prior to orthodontic intervention.

CONCLUSION

To the practicing orthodontist, experience is the knowledge gained in reevaluating cases clinically with respect to accomplishments made throughout the period of treatment. Unfortunately, growth and development in any given case of malocclusion are not as readily perceptible as treatment results viewed on before- and after-treatment study casts or cephalometric headplates. Growth and development are biologic, they are the least controllable, and they constitute perhaps the most significant role in correction of the malocclusion. To this role must be added the possibility of early as well as slow maturation in children. The clinician must decide as to the category or particular type in which the child who comes before him may be classified. He must be constantly watchful of certain influences, which were mentioned previously, in order to ascertain the limitations of his treatment.

Being mindful of all these factors, what better way is there to evaluate the maturational status of the child than by an assessment of his skeletal age as compared to his chronologic age? The carpal index, when used as a method of assessing skeletal age, offers but another arrow pointing toward the direction in which one wishes to go in the correction of malocclusion. When treatment is correlated to the dentofacial growth and development analysis offered by cephalometrics, we have another beacon to light the way toward resolving our malocclusion problems.

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5601 RIVERDALE AVE.

TORQUE AND ITS APPLICATION TO ORTHODONTICS

ERMAN D. RAUCH, D.D.S., JOPLIN, MO.

INTRODUCTION

TORQUE of the edgewise wire is probably one of the most important and potent forces of the edgewise arch mechanism. Since it is the least discussed, however, it often is not thoroughly understood. With proper understanding and with a systematic, technical approach, torque is not difficult to accomplish. The operator's ability to control torque properly will mean the difference between an artistically treated case that has all the esthetic beauty desired in the finished denture and an ordinary tooth-straightening accomplishment that contains very few of these desirable features. Torque is the force that enables the orthodontist to control the axial inclinations of teeth and to place them in the harmonizing positions that are so desirable for a nicely finished result. Torque is the force that gives the operator control over the movements of roots of teeth. It is the force that assists him in bringing about a desirable change of points A and B which, in turn, helps to bring about desirable facial changes in his patients. When the orthodontist does not have an understanding of torque, many adverse tooth movements will result, making orthodontic treatment more difficult and results of treatment less desirable.

The development of the cephalometric x-ray has demonstrated, in treated patients, clinical results that were previously thought impossible. To a certain extent, it has given the orthodontist an understanding of the desirable changes that he wishes to bring about during treatment, and it has also given him a more accurate approach to these problems. As one reviews the literature, it becomes evident that one of the most frequently encountered problems is the reduction of the difference between the angles SNA and SNB. To achieve this reduction, bodily movement of the anterior teeth is necessary. This movement cannot be accomplished without the proper application of torque force.

Holdaway[1] states: "In attempting to treat for apical base reorientation, as has already been pointed out, keeping a good labial axial inclination of the upper incisors should be one of our objectives. This is helpful because bodily retraction of these teeth affects a more marked reduction in the angle SNA than do mere lingual tipping movements of these teeth."

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood that it does not necessarily represent or express the opinion of the Board.

Buchin,[2] in his article entitled "The Edgewise Arch Appliance and Dentofacial Profile," concludes that the reduction of SNA is very desirable in cases with discrepancy in points A and B and is attained by employing strong Class II mechanics with anterior lingual root torque or labial crown torque.

The Orthodontic Study Group of Indianapolis, Indiana, composed of Drs. Stoner, Linquist, Vorhies, Hanes, Hapak, and Haynes,[3] found in their evaluation of fifty-seven consecutive cases treated by Dr. Charles H. Tweed that a reduction in point A was brought about by bodily retraction of the upper incisors.

Linquist[4] points out that the cephalometric results in the treated cases presented in his article entitled "The Lower Incisor—Its Influence on Treatment and Esthetics" reveal marked changes in denture base relationship, recontouring, relocation of points A and B, and extensive bodily movement of the upper and lower incisors.

It seems logical to conclude, then, as a result of these findings, that if the orthodontist is to obtain the results that these men indicate are desirable, a definite technique for the application of torque must be developed as well as an understanding of the forces which torque creates.

EXPLANATION OF TORQUE FORCE

Torque itself is merely the twisting of the edgewise wire. Torque force is created when the wire makes an effort to untwist itself when engaged in the brackets of the mechanism. The operator must realize that, because of the anatomic shape of the teeth, it becomes impossible to place an edgewise wire in the brackets of a completely banded arch without first placing proper torque in the wire in order to make it passive within the brackets. These facts then bring the orthodontist to the realization that there are two types of torque—(1) passive torque, which has no action or force on the tooth when engaged, and (2) active torque, which has a definite action or force on the tooth when engaged.

Torque force is named according to the action upon the tooth crown. Thus, there is lingual torque, which tends to tip the crown of the tooth lingually and the roots labially or buccally as the case may be (Fig. 1), and there is labial or buccal torque, which tends to tip the crown of the tooth labially or buccally as the case may be and the roots lingually (Fig. 2).

To illustrate the torque that is necessary to make an edgewise wire passive, let us consider the buccal and labial surfaces of the teeth and their axial inclinations. When a ruler or straight object is placed along the buccal surface of an upper right molar in the area and position in which a bracket would be placed, the ruler as it approaches the occlusal surface takes a position that points lingually. This lingual inclination will be more severe in the mandibular arch than in the maxillary arch. Likewise, it will be observed that the ruler assumes a more decided lingual inclination on the second molar and gradually diminishes on each succeeding tooth as it comes anteriorly, until the cuspid is reached, but at the cuspid the ruler assumes a nearly vertical position. This, then, indicates that if the operator wishes to have an edgewise wire lie passively in these brackets or devoid of any torque force upon its initial insertion, he must have

progressive lingual torque in the edgewise wire, beginning at the interproximal area of the cuspid and lateral incisor and becoming more severe posteriorly.

As the operator examines the central and lateral incisor area, however, he finds that in the majority of cases which he is called upon to treat the occlusal end of the ruler takes a position pointing labially. The pointing of the ruler in this direction indicates that labial torque of the wire in the incisal segment is necessary if the operator wishes to place the wire in the brackets of these teeth in a passive state without any undesirable lingual torque force being exerted upon them.

Fig. 1.

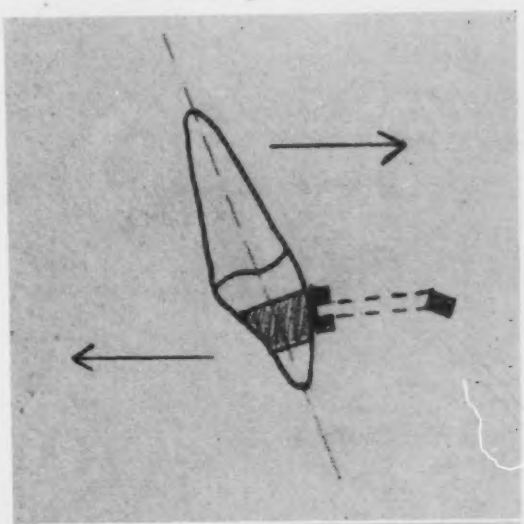


Fig. 2.

Fig. 1.—Lingual torque.
Fig. 2.—Labial torque.

The operator must remember that the torque of a wire, as examined by the inclination that the No. 442 pliers may assume as a result of grasping the wire, does not indicate the torque force that may be delivered to the teeth, since the amount of force delivered is determined only by the relationship of the wire to the bracket that is engaged and the position of the bracket is determined by the position of the tooth in question.

Fig. 3 shows labial torque of the arch wire as examined with the No. 442 pliers, but in this illustration no torque force is being exerted on the tooth since the beaks of the pliers are parallel to the bracket box. Fig. 4 shows the same labial torque of the wire. In this case, because of the extreme labial axial inclination of the incisor, lingual torque force is being exerted on the crown of the tooth, and the exertion of this torque force will cause the crown to go lingually and the root labially.

Fig. 3.

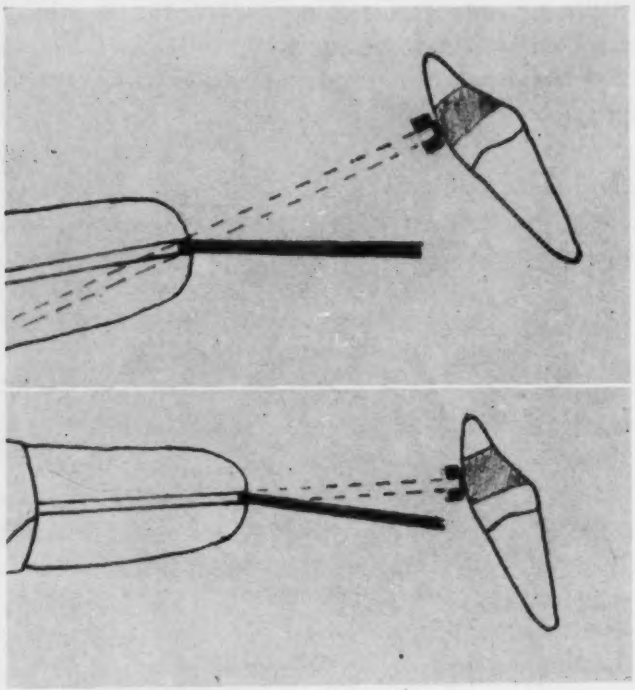


Fig. 4.

Fig. 3.—Labial torque of the wire but no torque force exerted on the tooth since the wire is parallel to the bracket box.

Fig. 4.—Labial torque of the wire but lingual torque force is created when the wire engages the bracket of this tooth.

TORQUE TECHNIQUE

As a general rule, in order to construct a passive edgewise wire after leveling, an operator must have progressive lingual torque from the cuspid distal and labial torque in the incisal segment. It is realized that there are numerous methods by which this may be accomplished, but the method to be described here is the one that I have found to be the most accurate and the least time-consuming. Likewise, a definite technique is established so that torque may be increased or decreased, as the occasion demands, with confidence that proper action has been obtained. In this method, a piece of edgewise wire is first inserted into the left molar tube and the wire is guided into the brackets around the arch to the right cuspid area. With crown-and-bridge scissors, each interproximal area, including the interproximal area of the right cuspid and

premolar, is marked on the wire with a snipping action of the scissors. Two or three marks should designate the interproximal area of the central incisors. After the wire is removed from the mouth, it is properly contoured on the arch former from cuspid to cuspid. At this time the wire should be checked to see that no adverse torque has been placed in the wire by manipulation with the arch former. This is best done with the No. 442 pliers.

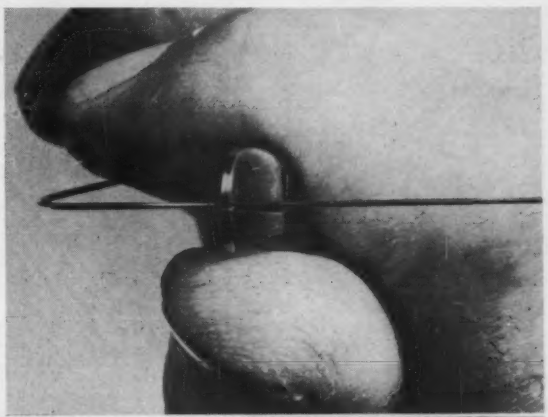


Fig. 5.

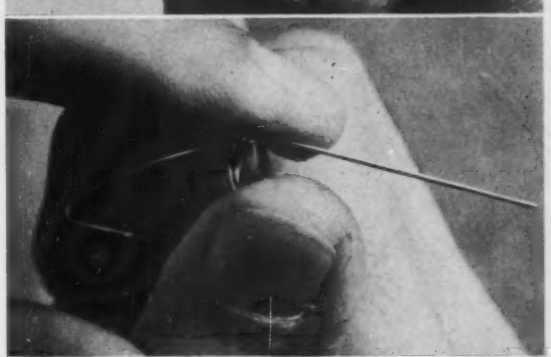


Fig. 6.

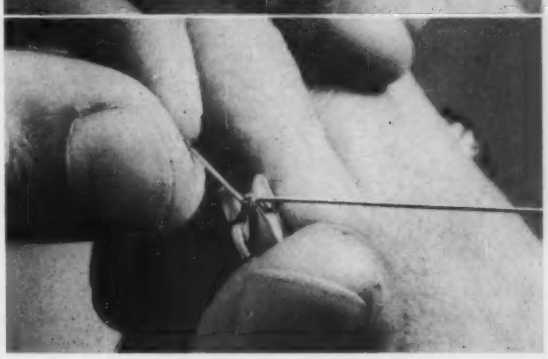


Fig. 7.

Fig. 5.—The wire is grasped with the pliers distal to the interproximal mark of the right lateral incisor and cuspid.

Fig. 6.—The wire distal to the pliers is bent occlusally.

Fig. 7.—The wire mesial to the pliers is bent twice as far gingivally.

The next step is to place a small "V" at the interproximal area of the lateral incisor and cuspid. This small "V" will act as the dead area of the wire from which the operator will place labial torque for the incisal segment and

progressive lingual torque for the buccal segment. The wire should be grasped with a small No. 139 bird-beak pliers or narrow-beaked No. 442 pliers just distal to the interproximal mark between the left lateral incisor and cuspid (Fig. 5).

Fig. 8.

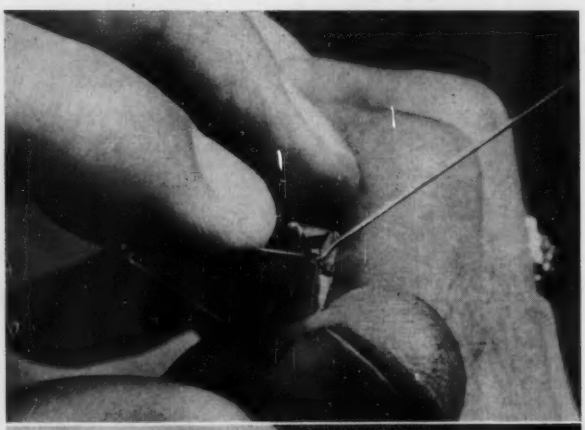


Fig. 9.

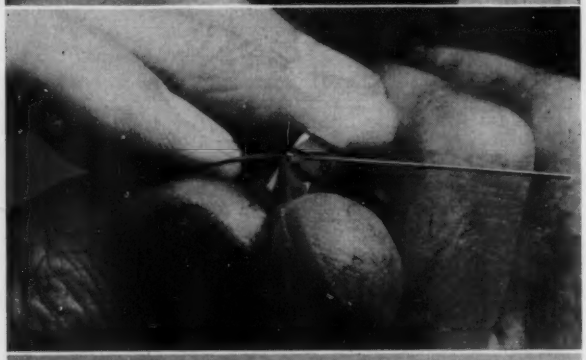


Fig. 10.

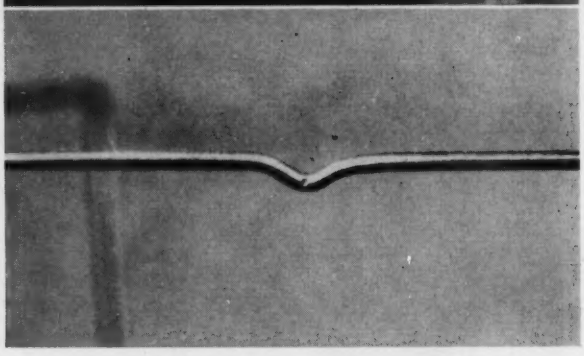


Fig. 8.—The pliers are moved mesially to the gingival bend.
Fig. 9.—The wire mesial to the pliers is bent occlusally until horizontal.
Fig. 10.—The "V" established in the wire at the interproximal mark.

The wire distal to the pliers should be bent occlusally with the fingers (Fig. 6). With the pliers in the same position, the section of the wire mesial to the pliers should then be bent gingivally, twice as far as the distal leg was bent occlusally (Fig. 7).

Next the beaks of the pliers should be moved mesially until the sharp gingival bend of the wire lies to the distal of the pliers (Fig. 8); then the wire mesial

to the pliers should be bent occlusally again until the arch wire is again on a horizontal plane (Fig. 9). This bending will place the "V" occlusally, and its apex will be the original marking of the interproximal area (Fig. 10).

The orthodontist should go through the same procedure at the interproximal area between the right cuspid and lateral incisor. A "V" has now been established between the cuspid and lateral incisor on each side, and the operator is ready to place the proper torque in the arch wire to make it passive. However, he should check this wire to be sure no torque was placed in the arch wire while the "V's" were being bent.

Fig. 11.

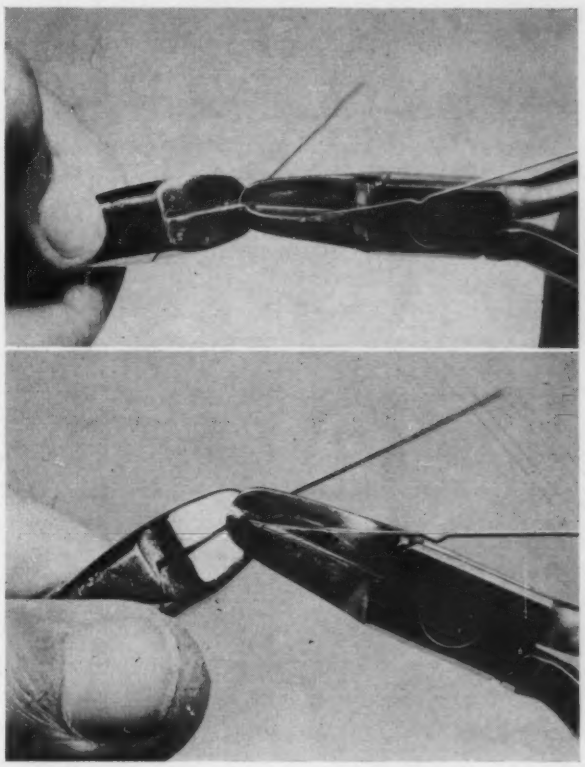


Fig. 12.

Fig. 11.—The pliers in the right hand grasp the wire from the lingual side and mesial to the pliers in the left hand.
Fig. 12.—The pliers in the right hand are twisted occlusally.

With the narrow-beaked No. 442 pliers in the left hand, the operator should grasp from the labial side the mesial leg of the "V" between the right cuspid and lateral incisor. The width of the beaks of these pliers should not be any greater than the length of the leg of the "V." The left hand should rest firmly upon the workbench or some support, as this should not be allowed to move during the time that the wire is being twisted. With another pair of No. 442 pliers in the right hand, the operator should grasp the wire from the lingual side and mesial to the pliers in the left hand. The beaks of both pliers should be parallel to one another as they grasp the wire (Fig. 11). Keeping the left hand firmly on its

support, the operator should twist the pliers in the right hand downward or occlusally. As this is done, it will be noted that the left leg of the arch wire will drop occlusally, depending upon the amount of twist accomplished (Fig 12). The pliers should then be moved to the left "V" and placed in identically the same manner; that is, while the pliers in the left hand grasp the mesial leg of the "V" from the labial side, the pliers of the right hand grasp the wire from the lingual side mesial to the pliers in the left hand. Again, with the left hand firmly on the workbench or table, the operator should press the pliers of the right hand occlusally or downward, twisting the wire between the two beaks until the buccal segments of the arch wire are once again parallel to one another.

In checking with the No. 442 pliers, the orthodontist will observe that labial torque has been placed in the arch wire and that the buccal segments are parallel to one another (Fig. 13); however, the torqued area of this wire will have an undesirable curvature to the gingival. This must be removed if the wire is to lie passively in the brackets of the anterior teeth (Fig. 14). To accomplish the removal of the curvature, the operator should grasp the wire with the No. 442 pliers just mesial to the "V" and bend the wire a very slight amount gingivally or in the direction of the torque (Fig. 15). Next the pliers should be moved slightly toward the median line, and again the wire should be bent gingivally with the fingers (Fig. 16). This operation should be continued with a series of small bends until the median line is reached. In Fig. 17 the undesirable curvature has been removed from the right "V" to the median line, and once again this section of wire is in the same horizontal plane as the buccal segments. Now the operator should begin at the left "V" (Fig. 18) and accomplish the same bends until again the median line is reached. This procedure will establish once more the entire labial section of the wire in a horizontal plane with the buccal segment. There will be no adverse curvature of the incisal segment (Fig. 19), but there will be the desired labial torque in this incisal segment. After placing the artistic positioning bends for the incisor teeth, the operator should now shorten the right side to its approximate length. This length should be determined by measuring the wire against the old arch wire that has been removed from the patient's mouth. When the wire is placed in the brackets of the anterior teeth, if the orthodontist has passive labial torque, the buccal segment of the wire should lie along the brackets of the posterior teeth. The interproximal areas of the right buccal segment should be marked on the arch wire, and then the wire is removed. Proper first-order bends should be placed in the buccal segments.

Next the correct progressive lingual torque is placed in the buccal segment. With the small-beaked No. 442 pliers in the left hand the orthodontist should grasp the distal leg of the "V," and with another pair of small-beaked No. 442 pliers in the right hand he should grasp the buccal segment of the wire distal to the pliers in the left hand and in the region of the buccal tube (Fig. 20). With the pliers in the right hand, he should twist the wire toward the occlusal surface (Fig. 21). This twisting will give the wire decided lingual torque in the molar area, but the torque will gradually diminish as it approaches the "V" area in the region of the cuspid. By means of this twisting, progressive lingual

torque is established in the buccal segment. After the same operation has been accomplished on the opposite side, the wire should then be tested for proper lingual torque of the buccal segment. To do this, the wire is placed in the left buccal tube; if the wire falls parallel to the right buccal tube, the left buccal

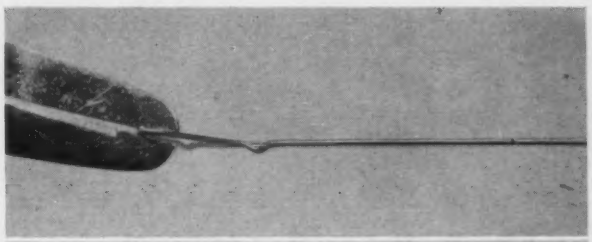


Fig. 13.

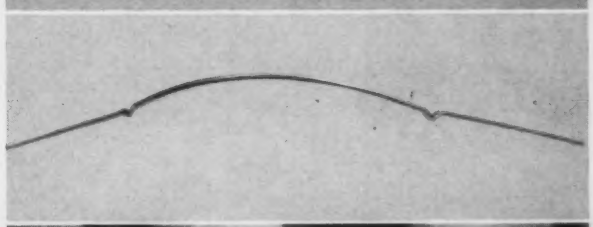


Fig. 14.

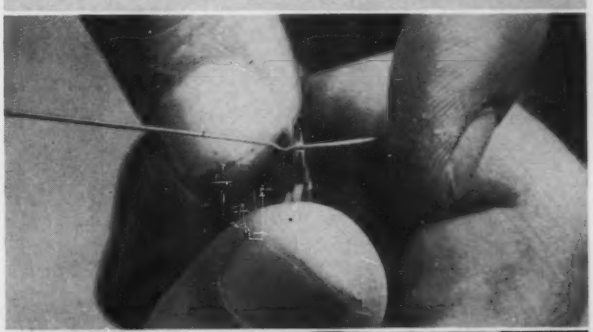


Fig. 15.

Fig. 16.

Fig. 17.

Fig. 13.—Labial torque established between the two "V's."

Fig. 14.—Adverse gingival curvature of the labial section of the arch wire.

Fig. 15.—Removing the adverse gingival curvature from the labial section of the arch wire.

Fig. 16.—The pliers are moved slightly toward the median line.

Fig. 17.—The adverse curvature toward the gingival side has ben removed from the right "V" to the median line.

segment is properly torqued. Then the right buccal segment is checked by reversing the procedure. Proper stops and attachments should then be added as desired. This gives a passive edgewise arch wire which has torque but no torque action.

Fig. 18.

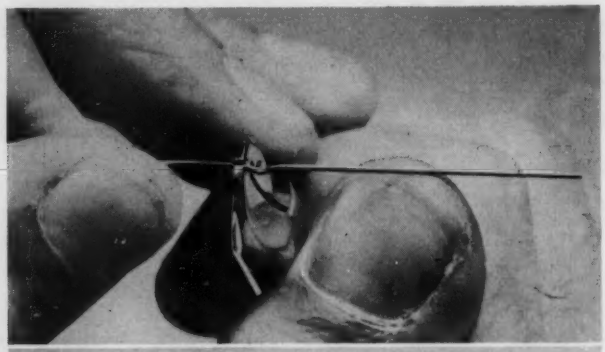


Fig. 19.

Fig. 20.

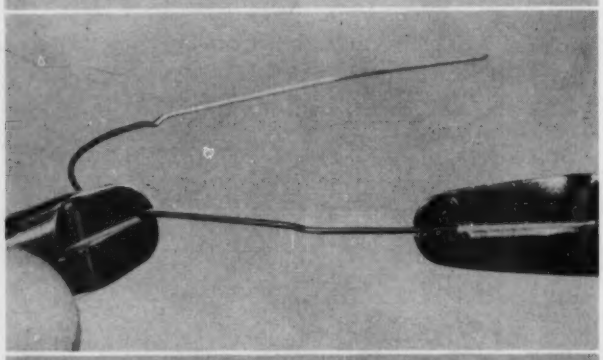


Fig. 21.

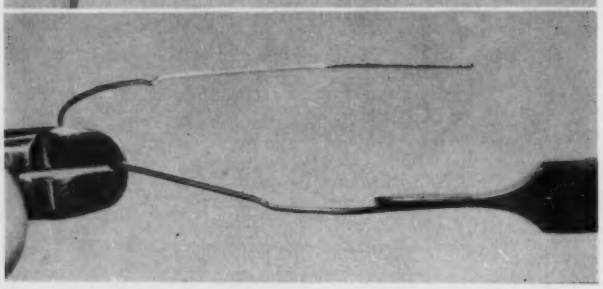


Fig. 18.—Removing the adverse gingival curvature of the labial section from the left "V" to the median line.

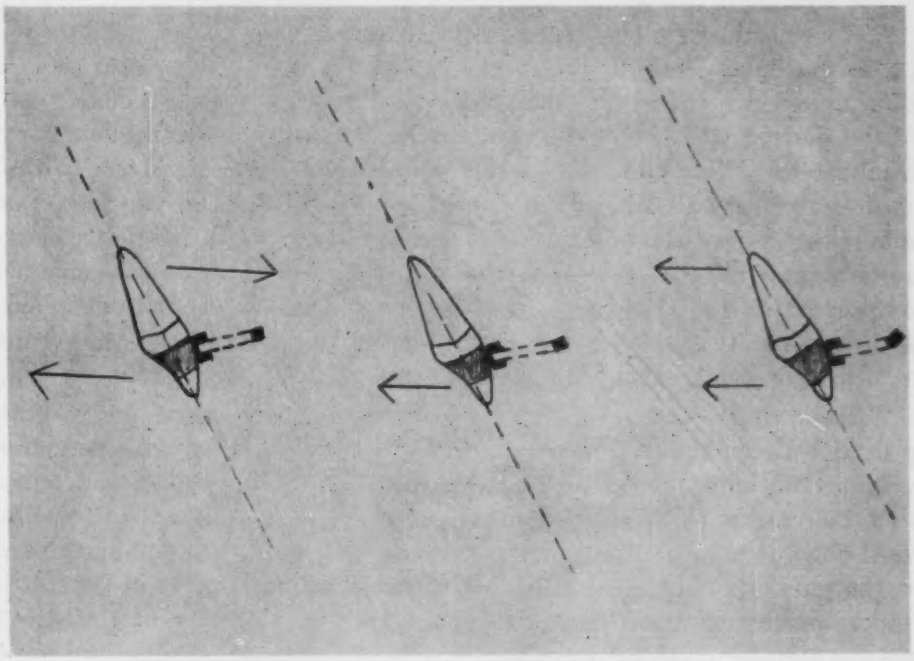
Fig. 19.—Adverse gingival curvature removed from the labial section.

Fig. 20.—The pliers in the right hand grasp the wire in the buccal tube area, and the pliers in the left hand grasp the distal leg of the "V."

Fig. 21.—Twisting the pliers in the right hand occlusally.

If the orthodontist is to control the axial inclinations of the anterior teeth, he should always remember that lingual pressure exerted by an arch wire on the teeth will create a lingual movement of the crown, but that, because of the

point of contact of the wire on the crown of the tooth, the apex of the root does not remain stationary. Somewhere along the axis of the root is created a fulcrum. Hence, the crown is moved lingually and the apex of the tooth labially, as in Fig. 22, *A*. In controlling the axial inclinations of the anterior teeth, this is where torque force plays such a vital role in our treatment procedure. If the operator expects to keep the apex of the root of a tooth in the same position while he is tipping teeth lingually, he must have a mild labial torque action being exerted on the crowns of these teeth while at the same time he is having a lingual pressure exerted on them, as is indicated in Fig. 22, *B*. This labial and lingual pressure will move the fulcrum to the apex of the root, thus keeping the apex in its same relative position while the crown is moved lingually.



A. *B.* *C.*

Fig. 22.—Drawing *A* indicates lingual pressure being exerted on the crown, causing the crown to go lingually and the root labially. Drawing *B* indicates the degree of labial torque necessary to maintain the root apex in its original position while tipping the crown lingually. Drawing *C* indicates the degree of labial torque necessary to cause the tooth to move bodily in a lingual direction when lingual pressure is exerted on the tooth.

The proper degree of torque for creating this action would involve having the buccal segments lie just gingival to the buccal tube when the torque is tested in the incisal segment.

Likewise, if the orthodontist expects to move the anterior teeth bodily in a lingual direction, the torque force must be increased as shown in Fig. 22, *C*. This torque force is increased by the methods previously described for placing labial torque of the incisal segment, until the arch wire lies 6 to 8 mm. gingival to the buccal tube when the operator tests for labial torque by placing the wire in the brackets of the anterior teeth. As a general rule, the wire can still be forced into the brackets with finger pressure and seated entirely by tying with

the ligature-locking pliers. This torque action, along with a lingual pressure, will carry the teeth lingually in a bodily manner. During the process of retracting the anterior teeth, it may be necessary to increase the labial torque in order to maintain the anterior teeth in a desirable axial inclination. During this period of bodily retraction of the upper anterior teeth, point A makes its desirable change by moving lingually as the teeth are moved lingually.

Brodie first called attention to the fact that, in order to have mass torque action in the buccal segment, progressive torque is necessary; otherwise, when the wire is inserted in the bracket of the cuspid tooth, the bracket removes the torque action from the teeth distal to the cuspid tooth, and the wire lies passive in the brackets of each succeeding tooth until the cuspid tooth movement has been accomplished.[5]

The same thing is true of the incisal segment. The twist of the wire for the incisal segment is made distal to the lateral incisor. Therefore, any labial torque force which the orthodontist incorporates in the incisal segment will not have the desired effect on the central incisors unless progressive labial torque is established. Whenever the incisal segment is being retracted, additional labial torque must be added to the central incisors to establish progressive labial torque if the desired action is obtained; otherwise, a "rabbiting" of the central incisors may occur. This labial torque is accomplished in the same manner by which the entire incisal segment was torqued, except that the holding pliers are placed on the section of wire between the lateral incisor and the central incisor that forms the step bend for the artistic positioning of these teeth.

With the pliers in the left hand the operator should grasp the wire at the step bend between the right central and lateral incisors, and with the pliers in the right hand he should grasp the wire from the lingual aspect and mesial to the holding pliers in the left hand. The pliers in the right hand should be pressed downward or occlusally until the buccal segments are no longer parallel. Next the pliers should be moved to the left side; with the pliers in the left hand the operator should grasp from the labial aspect the portion of the wire that forms the step bend between the left central and lateral incisors, and with the pliers in the right hand he should grasp the wire from the lingual aspect and mesial to the pliers in the left hand. Again the pliers in the right hand should be pressed downward or occlusally until the buccal segments are parallel.

By following the preceding instructions, the operator will increase the labial torque for the central incisors and at the same time establish the necessary artistic positioning for these teeth, since any time that the labial section of an arch wire is torqued an adverse curvature is created toward the gingival surface.

Whenever it is increased, labial torque automatically increases the artistic positioning bends of the central and lateral incisors. This increase of artistic positioning occurs as a result of the gingival curvature created in a wire by torqueing it. Therefore, when labial torque is increased as treatment progresses and when the mesial axial inclinations of the central and lateral incisors are in the desired positions, it becomes necessary to remove some of the artistic positioning bends; otherwise, the mesial axial inclinations of these teeth will be increased to an undesirable position.

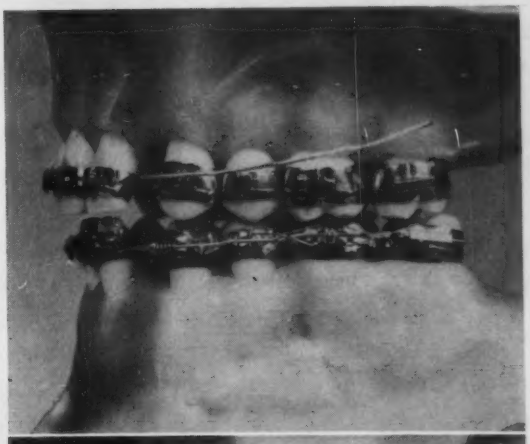


Fig. 23.

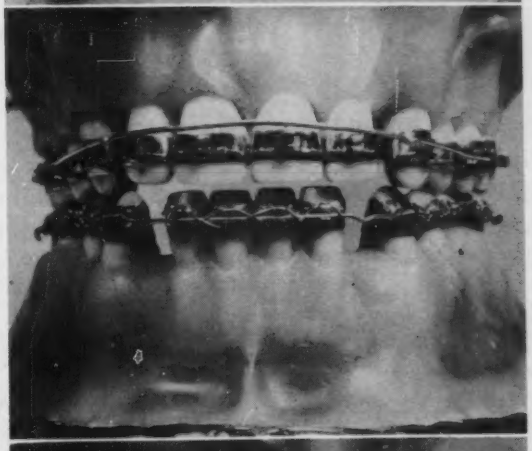


Fig. 24.

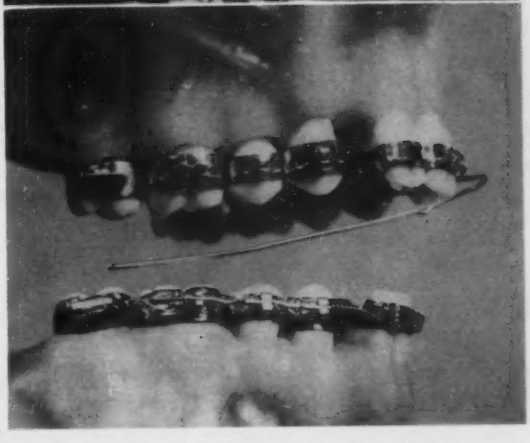


Fig. 25.

Fig. 23.—Increased curve of Spee adjustment with labial torque action on the incisor teeth. The wire lies a great distance gingival to the buccal tube.

Fig. 24.—The same curve of Spee adjustment as shown in Fig. 23, but with the wire lying a lesser distance gingival to the brackets. This difference indicates labial torque action on the incisors.

Fig. 25.—Increased lingual torque of the buccal segment to prevent an undesirable buccal axial inclination of these teeth when a mesial pull is exerted on them.

It must be noted that increasing the curve of Spee in an edgewise wire will not increase the labial torque action on the incisal segment. If labial torque action is desired on the maxillary incisors where an exaggerated curve of Spee adjustment is necessary, then during testing for labial torque by placing the wire in the incisal brackets (Fig. 23), the buccal segment of this wire must lie a greater distance gingivally to the molar tubes than when the wire is placed in the buccal tube and the wire is observed to lie gingivally to the incisor brackets (Fig. 24).

When a mesial pull is placed against a buccal segment, whether it is from force exerted by a closing arch wire or by elastics, the progressive lingual torque should be increased to prevent these teeth from acquiring an undesirable buccal axial inclination. Fig. 25 demonstrates testing for torque action of the left buccal segment and the force necessary to prevent the anchor teeth from acquiring an undesirable buccal axial inclination during the time that a mesial pull is being exerted on them.

CONCLUSION

In order to attain our present-day goals of treatment, a definite technique for the application of torque force becomes imperative. The orthodontist will experience little difficulty if he will keep in mind the following fundamental principles: the crown of a tooth moves in the direction of torque; the root of a tooth moves in the opposite direction of torque; and, by the application of an auxiliary force derived from elastics or other sources, this torque action can be altered in such a way as to cause either the root or the crown of a tooth to move in whichever direction the operator may desire.

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ORTHODONTIC TREATMENT OF A PATIENT WITH POTT'S DISEASE

Report of a Case

Eugene F. Butori, D.M.D., M.S.D., Portland, Ore.

THE patient was a white girl, aged 10 years 5 months 26 days. She was wearing a complete body cast from shoulders to hips, two leg braces, and a chin-cup extension from the chest area of the cast upward. Interrogation of the parents revealed that the youngster was a victim of Pott's disease at the age of 2 years.

Pott's disease is a tuberculous hematogenous infection of the vertebrae which usually begins in the center of the body of a vertebra. The bone center becomes caseous, and the disease spreads to and destroys the intervertebral discs but spares the transverse processes, spines, and articular processes. Due to the destruction of the discs, the bodies collapse in front while the spines remain intact behind, so that an acute curvature develops with its convexity pointed backward. In children there usually is evidence of pressure on the cord, due not to the angling of the spine but to the formation of tuberculous granulation tissue under the posterior common ligament which presses on the cord.

With this physical history, it was apparent that throughout her lifetime this patient's activities would be greatly curtailed. This, coupled with her severe malocclusion, presented a rather bleak future. It became immediately apparent that any help that we could give her was essential to improve the function, esthetics, and longevity of the denture.

In addition to Pott's disease which she contracted at the age of 2 years, the patient's medical history revealed that she had had measles, mumps, and chickenpox. All of the latter diseases were mild with no apparent effects. She was, of course, under the constant surveillance of her physician due to the Pott's disease. The etiology of the malocclusion was probably influenced by the disease itself, plus the necessary brace supports which it inflicted. The girl's mother and father and a younger brother appeared to be normal.

According to Angle's classification, this patient presented a Class II, Division 2 malocclusion (Figs. 1, 2, and 3).

The jaw anomalies presented a pronounced micromandibular development with a complete buccal cross-bite of the maxillary denture.

The maxillary central incisors were axially inclined lingually, and the lateral incisors were axially inclined labially with an 8 mm. distance vertically between their incisal edges (Fig. 1). When the occlusion was viewed from the right or left buccal segment, the amount of forward positioning of the maxillary permanent molars in relation to the lower molars could be seen. The primary molars were completely buccal affording no occlusion with the lower denture whatsoever (Figs. 2 and 3).

The mandibular denture exhibited a supraerupted incisor segment with the buccal segment infraerupted. The lower right second premolar was completely blocked buccally, the lower right first premolar was distolingually inclined, and the molar was tipped mesially (Figs. 4 and 5).

This case report, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board, but it should be understood that it does not necessarily represent or express the opinion of the Board.

Fig. 1.

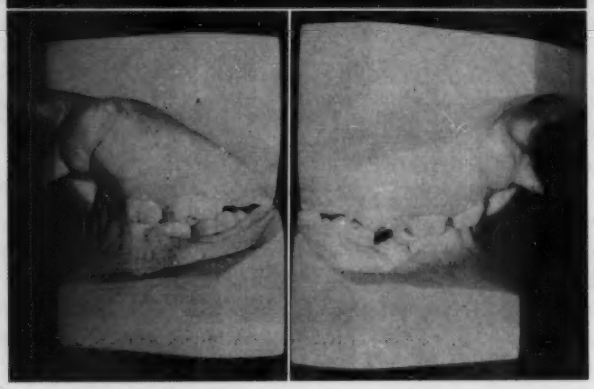


Fig. 2. Fig. 3.

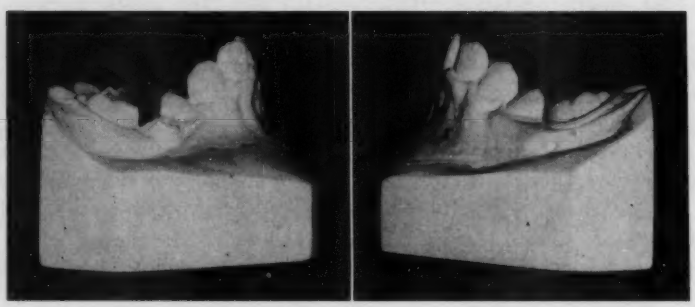


Fig. 4. Fig. 5.

Fig. 6. Fig. 7.

On the lower left buccal segment the cuspid and the first premolar were distally inclined, the molar was mesially inclined to contact the first premolar, and the second premolar was completely blocked from erupting (Fig. 5).

When viewed occlusally (Figs. 6 and 7), the labiolingual and buccolingual inclinations could be observed as previously described.

The intraoral films appeared essentially negative except for the unerupted teeth. All teeth appeared to be present. The cephalometric survey (Fig. 8) indicated inadequate growth of the mandible plus complete denture placement disturbance. A myofunctional analysis disclosed no discernible dysfunction.

NAME						DATE I	DATE II
AGE		−	MEAN	+	±	NOV. 55	AUG. 57
SKELETAL	Facial angle	82	87.8	95		80	84
	Convexity	10	0	−8.5		14	13
	AB plane	−9	−4.6	0		11	9
	Mandibular plane	28	21.9	17		19	19
	Y (growth) axis	66	59.4	53		57	57
DENTURE	Occlusal plane	14	9.3	1.5		11	13
	$\bar{1}$ to $\underline{1}$ angle	130	135	150		164	137
	$\bar{1}$ to occlusal plane	20	14.5	3.5		4	19
	$\bar{1}$ to mandibular plane	7	1.4	−8		−4	+10
	$\underline{1}$ to AP plane (m)	5	2.7	−1		1	5
	$\underline{1}$ to Frankfort horizontal plane	121	110	99		59	105

Fig. 8.

Before the treatment plan was decided upon, a consultation with the patient's physician was held and the advisability of removing the mandibular restraint was explained. Inasmuch as the physician felt that it was not as great an aid to the patient as it appeared to be a detriment, the chin cup was removed. Four first premolars were then extracted by an oral surgeon. Following this, active orthodontic treatment was instituted.

At the first appointment the maxillary first permanent molar bands and four incisor bands were cemented into place, and an 0.012 inch upper arch wire was inserted. Three weeks later an 0.016 inch arch was placed, and the same arch was adjusted at the next two appointments. Following this, an 0.018 inch upper arch was placed and a separation was inserted for banding of the lower arch. At the following appointment the entire lower arch was banded, with an 0.016 inch lower arch being inserted and an 0.020 inch upper arch being placed. During the subsequent four months the maxillary and mandibular arches were either adjusted or changed, with only round arches being used.

Eight months after the bands had been placed, a lower rectangular 0.0215 by 0.027 inch (reduced) arch wire was placed and the maxillary premolar and cuspid bands were cemented. At the following appointment an upper rectangular 0.019 by 0.026 inch arch was placed and Class II elastics were instituted. These two rectangular arches were then adjusted or changed during the next three months with constant wearing of the elastics. After seventeen months from the date of placement of the first orthodontic bands, the bands were removed, an upper Hawley retainer was placed, and a lower lingual acrylic retainer was made.

Figs. 9 to 13 show the models one year out of retention. As of this writing, another nineteen months has elapsed with no relapse in evidence.

The facial results obtained (Fig. 14) showed marked mandibular improvement with results that were nothing short of miraculous. The oral tissues had

lost the inflamed, puffy look which they exhibited at the start of treatment, and the occlusion was restored to normal with a resulting Class I molar relationship and a decided opening of the bite due to the leveling of the mandibular denture.

The cephalometric roentgenogram (Figs. 8 and 15) at the end of treatment demonstrated a decided downward and forward growth of the mandible, with the maxillary base essentially stable. By superpositioning on point A and along

Fig. 9.

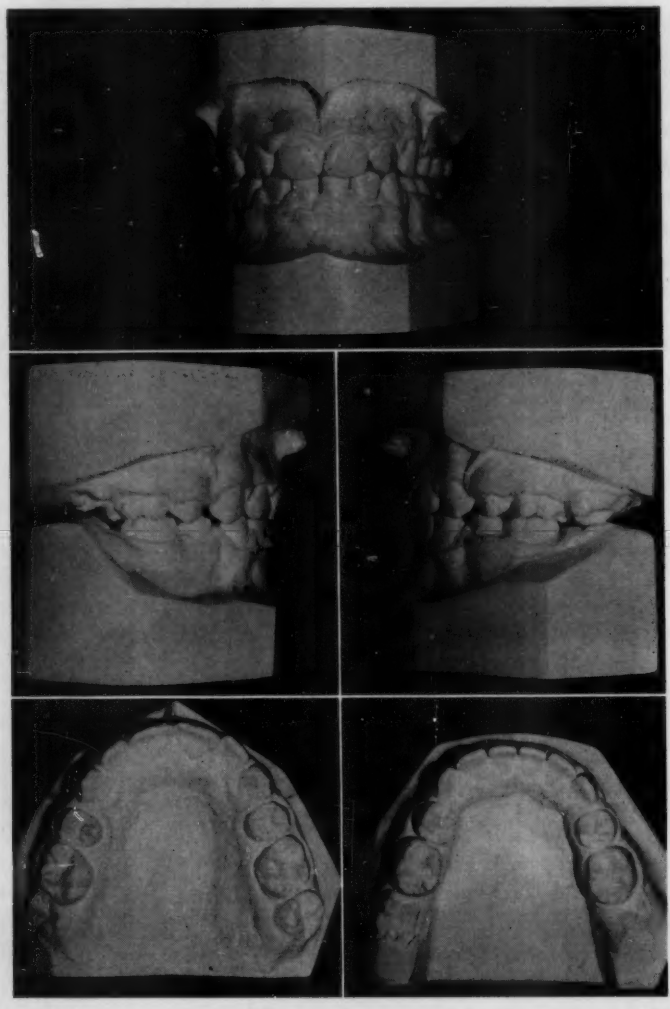


Fig. 10.

Fig. 11.

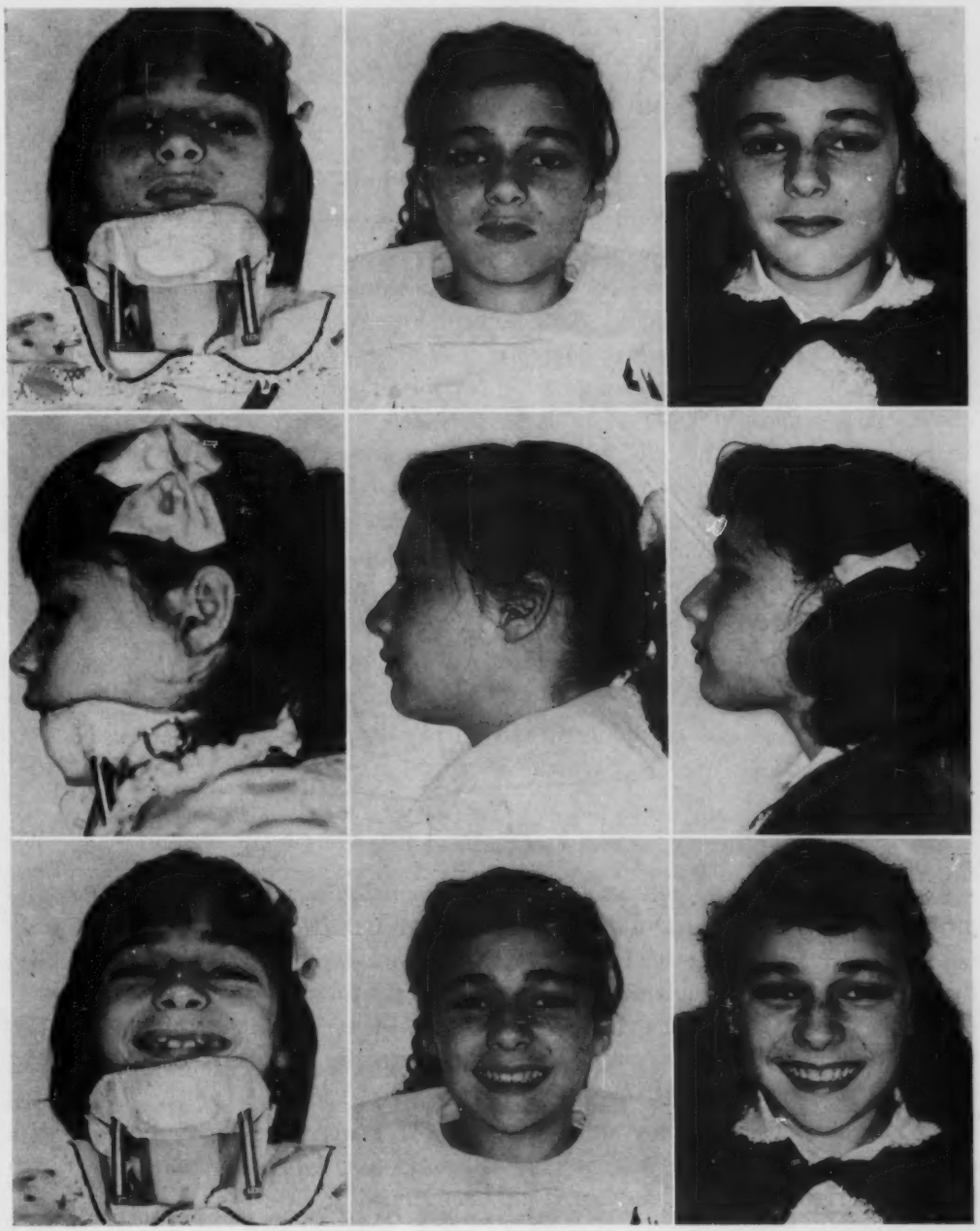
Fig. 12.

Fig. 13.

the palatal plane, it can be seen that the maxillary central incisor has been decidedly torqued in a labial crown direction with the resulting incisal edge of the central incisor labial, being brought forward approximately 11 mm. and the root apex lingual 6 mm. The maxillary molar crown has been brought mesially 4 mm. with the roots in the same relative position as before treatment.

To investigate mandibular tooth movement, the tracings of the mandible were superimposed, the symphysis and the mandibular border serving as points

of reference. The lower incisor has been depressed 5 mm. and the fulcrum appears to have been at the cementoenamel junction, for the incisal edge has been torqued labially 5 mm. and the apex lingually 5 mm. The mandibular molar has been elevated 5 mm. and brought mesially 3 mm. at the mesial marginal ridge of the crown while the roots have been repositioned mesially 7 mm.



A. *B.* *C.*

Fig. 14.

To study an over-all growth performance, reference points used were sella turcica centered and S-N line superimposed. Nasion appears to have grown forward about 2 mm. Point A has grown rather slightly (1 mm.) downward and forward, whereas the mandible appears to have grown downward 8 mm. and forward 12 mm.

Fig. 15.

The final records, consisting of both cephalometric roentgenograms and models, will certainly bear out the ideal results obtained, but they do not fully explain the process of getting there. Did the mandible grow as much as it did due to the removal of the chin cup? Or was it stimulated by the use of Class II elastics? Would as much growth have been evident without orthodontic intervention? Was the maxillary bone growth inhibited by the headgear application? Or was it already stable at the onset of treatment?

The questions posed are unanswerable. If I were presented again with a similar problem, however, I know that I would not depend on natural growth alone to correct such a maladjusted jaw relationship.

1033 S. W. Yamhill.

THE EARLY YEARS OF THE EUROPEAN ORTHODONTIC SOCIETY

HAROLD CHAPMAN, F.D.S., D.ORTH., R.C.S.(ENG.), LONDON, ENGLAND

FOUNDATION OF THE SOCIETY

NO TITLE for my address appears on the program, so you may be wondering what it is about. I will enlighten you at once—it concerns a birthday. This Society has been in existence nearly fifty-one years; Sept. 27, 1957, was the jubilee, the fiftieth anniversary of its birth. This is the first opportunity to refer to it. Our president decided that the occasion should be commemorated and has honored me with an invitation to give an account of the early years of our Society. Presumably I was selected as an "elder statesman," but I was surprised to find that I am not quite the "old boy" I thought I was, or perhaps that our president thought I was. I only became a member in 1922. Had I been elected at the preceding meeting, it would have been in 1914, which seems much longer ago; there was no meeting between these dates. It is true that a paper by myself[6] appears in the 1909 *Transactions*, but as I was not in Wiesbaden at that time it must have been read "in absentia."

This review deals chiefly with affairs up to and including 1914. The *Transactions* up to this date are probably rare.

The following extracts from the first presidential address[16] on Sept. 27, 1907, are not without interest:

> Today is an important one for all who are interested in the progress . . . of orthodontia in Europe. It marks the beginning of what we hope will be a great power in this special field in stimulating to greater efforts all those who essay the practice of this most important branch of medical science. . . . The malocclusions of Class II have been the greatest difficulty to solve, both as to the cause and effect and the treatment and retention; and until we arrive at one clear understanding regarding these cases, until we all work along the same lines, until then orthodontia cannot clearly be defined as a science. But that day is coming soon. . . .

Recent programs of orthodontic society meetings indicate that this problem is still with us.

NAME

When our Society was founded, it was named The European Orthodontia Society. (The word *orthodontic* was first used in 1909.)[24] By 1914 the name

Read at thirty-fourth annual meeting of the European Orthodontic Society, Copenhagen, Denmark, July 4-8, 1958.

had been changed to The European Orthodontological Society. In the 1935 *Transactions* it is designated The European Orthodontic Society, and it remains the same today.

ORIGINAL CHARTER MEMBERS

Annual programs list the original charter members: E. D. Barrows, Miss Jane Bunker, J. J. Giusti, J. Grünberg, G. A. Kennedy, W. G. Law, A. F. Lundström, M. Pfluger, L. A. Watling, and F. Zeliska. Biographic notes of each follow.

E. D. Barrows was a very fine American with a practice in Berlin which he transferred to London at the time of the first World War. There were a large number of Americans practicing in various cities of Europe at that period. Dr. Barrows was president of this Society in 1912. His name appears in the records as a censor, and I recall assisting him in editing the *Transactions* a very difficult and wearisome task since some authors had written their papers in English which could not be understood. I think that, in a quiet way, Dr. Barrows worked hard for the Society.

Miss Jane Bunker, who I have little doubt was an American, took the Angle course in 1904 and was practicing in Berlin when the Society was founded in 1907, although the address I have found for her is New York.[4] Miss Bunker was a member of the Eastern Association of Angle Graduates and at its second meeting on May 27, 1911, gave a clinic entitled "Models Showing Correct Median Line."[5]

J. J. Giusti practiced in Leipzig when the E.O.S. was formed, but in the 1913 *Transactions* (p. 330) his address is given as Buenos Aires.

J. Grünberg took the Angle course in 1905, and it was there that I met him. He was a German, practicing in Berlin, a very capable, hard-working man. Angle made him superintendent of his school for at least one session of probably six weeks, which showed great appreciation of his ability. This assignment necessitated his crossing the Atlantic. The words "applied orthodontia" appear after his name in the prospectus.[13] Many of you may know the Grünberg blowpipe. Dewey,[10] when exhibiting a number of orthodontic accessories devised by Grünberg, quoted Angle as saying of them: "They have been carefully thought out by a mind unusually well qualified to think, to reason, and to produce, and what he has produced fills our needs." He translated into German the seventh edition of Angle's *Malocclusion of the Teeth.*

G. A. Kennedy, probably an American who practiced in Berlin, was vice-president for the first two meetings of the Society. He read a paper at the first or second meeting.[15]

William G. Law, an American practicing in Berlin, took the Angle course in 1903. I believe that he was the moving spirit in the founding of the Society. He served as its first president, and during the two years that he was in office both meetings were held in Berlin. In 1909 he was named secretary and continued in that office for two more years. At the first meeting, in addition to his presidential address,[16] he read a paper entitled "Retention of Class II Cases: The Staple and Hook Sectional Retainer."[17]

Axel Lundström, a Swede, practiced in Gothenburg when the Society was formed, but he soon moved to Stockholm and probably became the first orthodontic specialist in Europe. I say "probably" because it has been suggested that Rubbrecht of Brussels may have preceded him. Dr. Lundström visited America early in his career and spent time with Angle, although he did not take the course. He was president of the Society in 1909. He gave three papers[18-20] at the first two meetings, and he made trips to England and the United States to read papers. He was an unassuming man who became famous in the orthodontic world through his monograph entitled *Malocclusion of the Teeth Regarded as a Problem in Connection With the Apical Base.*[21] This was published in Swedish and English, in which he was proficient. On one occasion he brought with him to London an enormous trunk filled with models to illustrate his communication. He stayed at my home once in London, and when the time came for his departure he asked me if he could rely on my wife to get him to the station in time. My wife was always extremely punctual, so I did not hesitate to reassure him. However, he nearly missed his train because there was a tremendous traffic jam near the station, perhaps due to an accident. The situation became desperate, and my wife had to appeal to the policeman on duty to let her bypass the line of waiting traffic so that this distinguished visitor could catch his train and my wife uphold her reputation.

M. Pfluger attended the Angle School in 1904; he was president of the Society in 1910 and practiced in Hamburg.

L. A. Watling practiced in Berlin. He was the Society's first secretary-treasurer, occupying the position for two years.

F. Zeliska practiced in Vienna.

Of the ten charter members, five had close association with Dr. Angle, and four had taken his course. Thus, it may be assumed that Angle influenced the formation of the Society. In another way, the same may be said of the British Society.

OFFICERS

Some of the previous programs also list all the past meetings, where they were held (eleven countries), and the executive officers in charge. For the first five meetings all but four of the officers were Americans practicing in Germany; of the exceptions, three were Germans and one was a Swede. Subsequently, the officers became more representative of Europe, and we find also Belgian, French, and Dutch officers. Two English names appear on the program of the ninth meeting. Since then there has been representation of all the above and other European countries at various times, and so it continues to the present day. The first mention on the program of an editor is in 1930.

MEETINGS

Meetings are held annually. Although the Society has been in existence for fifty years, there have not been fifty meetings. Last year's meeting was the thirty-third. (In 1931 there was a business meeting only, which I have not counted but which is counted in the programs, reducing the number of "active" meetings to thiry-two.) Because of two wars, there were two seven-year periods

when no meetings were held—1915 to 1921 and 1940 to 1946, inclusive. In 1920 the Society's officers met in Paris and came to the conclusion that, owing to currency restrictions, etc., it would not be possible for the Society to resume meetings before 1921, and members were notified to this effect. It was May, 1922, when the Society met again.

The second World War began very shortly after the Bonn meeting in 1939, when the Society went into retirement. Early in 1947 O. Henry, who had been treasurer and editor since 1929, came to see me with a view to terminating the Society. We discussed the matter with my secretary, Miss Bradley, who did not approve of a defeatist attitude, and she persuaded us to revive the Society. I explained that this would mean work for her, but this was willingly undertaken. Every member was notified with the result that a few met at 26 Portland Place, London, W. 1, in June, 1947. At this meeting (or it may have been at a subsequent meeting), it was decided to hold the twenty-fourth meeting of the Society in Brussels in October, 1947, with A. E. Rowlett, of international fame, as president, Russell Marsh as hon. secretary, and O. Henry as editor-treasurer. Brussels was chosen, I believe, because that city did not have food rationing, which was in force elsewhere at that time. The preliminary local work was done by de Coster and Watry. Unfortunately, O. Henry was not well enough to go to Brussels; he died the following March, having been in office for eighteen years. Meetings have continued regularly since 1947, and the resuscitation has been justified as shown by the increasing membership, which has grown from 10 in 1907 to today's roll of nearly 400 from all over the world. Dr. Law, our founder, would be gratified by this almost fortyfold increase.

There were four other occasions when meetings were not held. In 1911 the proposed December meeting in Brussels was postponed until April, 1912; a second meeting was not held in 1912. In 1931 there was a business meeting only. In July, of that year the second International Orthodontic Congress (the last to date) was held in London, a sufficient reason for holding a business meeting only. At the meeting in 1935 it was "unanimously agreed that only a business meeting should be held in 1936 in Vienna, in view of the meeting of the F. D. I." (*Transactions,* 1935, p. 5), which in reality was the ninth International Dental Congress. It had been decided in 1949 to hold meetings biannually, so there was no meeting in 1950, but this happended only once and annual meetings were revived. Thus, the eighteen missed meetings are accounted for.

Three meetings have been held in conjunction with other societies. The fourth meeting in Vienna in 1910 was held jointly with the recently formed Vienna Society of Orthodontia, with two presidents—Joseph Grünberg of Berlin for the E.O.S. and Rudolf Loos of Vienna for the Viennese group—presiding. The former referred to the formation of the British Society for the Study of Orthodontia and the German Orthodontia Society.[14] It was at this meeting that there appeared on the program a paper by Albin Oppenheim of Vienna, entitled "Tissue Changes in Alveolar Process and Peridental Membrane Incident to Tooth Movement." I believe this to be the first occasion on which

Oppenheim reported his world-famous histologic studies, although the paper is not recorded in the *Transactions* as such but appears in the *Transactions* (October, 1911) under the title: "Tissue Changes, Particularly of the Bone, Incident to Tooth Movement: A Paper Read at the Sixth Annual Meeting of the Alumni Society of the Angle School of Orthodontia, New London, Conn., 1911"[23] with a footnote saying that a preliminary communication was made at the fourth annual meeting in Vienna in November, 1910. The above mention of the Vienna Society is the only one that I have found, except that at the tenth meeting in 1924 President Quintero, in his address[26] said he believed that the Vienna Society was now extinct.

In 1932 there was a joint meeting with La Société Française Orthopédie Dento-Faciale in Paris. This was repeated in 1953 at Monte Carlo. The 1932 *Transactions* take the form of two reports to be discussed at the meeting, which are entirely in French, one occupying 166 pages and the other 12 pages. At the joint meeting at Monte Carlo in 1953 each society had its own program, and the meetings were held consecutively in the same building. The E.O.S. *Transactions* of this meeting were in two languages, French and English, according to the author's nationality, whereas the French Society's *Transactions* appear to be entirely in French, the one paper by an English author[27] having been translated into French.

TRANSACTIONS

Transactions are an important feature of all Societies, perhaps more so in the case of international ones such as the E.O.S. because of the contacts which they maintain. The E.O.S. *Transactions* for the first two years, 1907 and 1908, are difficult to trace. It seems that Professor Sheldon Friel is the only person who has attempted to gather them together, with the result that he has collected the papers which he has found for both years into one volume consisting of seven papers, notices, etc., four in English (one a photostatic copy) from the *American Orthodontist;* five in German (two papers, Law's[17] and Grünberg's,[12] in both languages), presumably from the Austro-Hungarian dental journal *Oesterr.-ungar. Vierteljahrsschrift für Zahnheilkunde.* One cannot be sure if these transactions are complete, but it does seem that there would have been more than seven papers for two meetings of two days each. A list of the contents of this volume is appended (Appendix 1).

On page 536 of Friel's volume 1 (*Transactions,* 1907-1908) there is a preliminary program (in German) for the second meeting on Sept. 25 and 26, 1908, listing eight papers, none of which I have found. Nor has an explanation of their absence been found; this is difficult without a knowledge of German and access to the files of the Austro-Hungarian dental journal which appears to have been the official organ of the Society from 1907 to 1913.

The late Dr. James T. Quintero of Lyons has presented two bound volumes of the *Transactions* to the Society; the first contains proceedings for the years 1909 to 1912, covering three meetings (1909, 1910, and 1912). The other volume contains the proceedings for 1913 and 1914. Volume 1 begins with the heading:

"Oesterr.-ungar. Vierteljahrsschrift für Zahnheilkunde, Jahr. XXV, Heft III (Roman figures) Verhandlugen der Europäischen Gesellschaft für Orthdontie." This is followed by two papers—one by Lockett[22] and the other by Pfaff[25] read at Wiesbaden on April 7, 1909. This Heft III is entirely in German and is not contained in Friel's 1909 collection, although Lockett's paper in German, apparently removed from the Austro-Hungarian journal, and the English version from the *Dental Record* (June, 1909) are. The next section is headed "Wien, October, 1909, Heft 1. Transactions of the European Orthodontia Society. Supplement to the Oesterr.-ungar. Vierteljahrsschrift für Zahnheilkunde: Publisher Julius Weiss, Vienna. Then follow Hefts 2, to 13, each in German and English on opposite pages and each with a similar new title page. On the cover of Heft 6 there is a note to the effect that the French translation appears in the journal, *La Province Dentaire* (now extinct), which was published in Lyons and, I believe, edited by Quintero, an excellent linguist, who was undoubtedly responsible. Thus, it would appear that the first published *Transactions,* as such, in paper covers, including the first part marked Heft III and subsequent ones marked Heft 1 to 13, related to the third, fourth, and fifth meetings, although some (or possibly all) of the papers read at the first and second meetings had appeared in the Austro-Hungarian dental journal and the *American Orthodontist,* as already stated. References to our Society's papers, etc., printed in the *American Orthodontist* are given in Appendix 2.

Two articles, both noteworthy for their illustrations, appear in the *Transactions,* 1909-1912. One by J. Grünberg, entitled "Plain Bands in Orthodontia,"[11] was read at the third meeting in 1909, and the other by P. J. J. Coebergh, entitled "The Normal Dental Arch,"[7] was read at the fifth meeting in 1912.

The second Quintero volume ("volume" here, as in Friel's, is purely an arbitrary arrangement) contains the *Transactions* for the sixth and seventh meetings, with a paper-covered section for each year. The first, 1913 (sixth meeting), was printed in German and English by the Austro-Hungarian dental journal (Appendix 3). Discussions are included for both years. Someone (maybe more than one person) who must have been influential, deserves credit for both of these; I have not found a clue as to his identity.

The 1913 meeting was held in London from May 11 to May 14, with R. Anema of Paris as president. In a prologue, mention is made of this meeting as being "the first time in the existence of the Society that our proceedings appear united in book form. . . Paris, May 1st 1914." This volume consists of 330 pages. Dr. K. A. Davenport,[8] chairman of the Local Committee, in an address of welcome, said: "There is a tendency for all specialization to have a narrowing influence and it is important to guard against that. I make these remarks not in the way of dictating, but simply to give thought. We have to consider, for instance. whether the orthodontist is not an adjunct to the profession of dentistry, a man who has to help all practitioners engaged in the main practice of dentistry." Anema, as president, also gave an address.[1] In addition, thirteen papers were read by well-known members of the medical and dental professions. In the discussion on the paper by Bogue,[3] Mr. (later Sir) Francis Farmer, Dental Surgeon to the London Hospital, said that he was delighted to

be able to refer to the subject of the teeth of elementary school children. Dr. George Cunningham, his master and friend, was the first to draw his attention to what might be done by treating children's mouths, especially when associated with diseases of the nasal pharynx and mouth. There is also an account of seven demonstrations. Thirty-seven members in ten countries and one honorary member are listed.

Many well-known Americans attended the seventh annual meeting in Paris on July 28 and 29, 1914. Anema,[2] as president, gave an address. The address of welcome was given by I. B. Davenport.[9] Papers were read by Calvin S. Case, W. Zielinsky, A. H. Ketcham, R. Ottolengui, Angelo Chiavaro, E. Santley Butler, H. C. Ferris, and H. Hecht. There were also nineteen clinics, including one by Ben Schroeder.

In addition to the visitors mentioned above, there were, among others taking part in the discussions, Drs. Rubbrecht, M. H. Cryer, Day, Pullen, Aguilar, Bödecker, V. H. Jackson, and Lind. Probably this large attendance of visitors from abroad was attracted not only by the E.O.S. meeting but also by the sixth International Dental Congress in London, which opened on Aug. 4, 1914, just after war had broken out. One wonders what difficulties they had to surmount in order to get home.

The *Transactions* of this meeting were printed (in English only) in 1917 by the *Dental Cosmos,* a monthly journal now extinct, belonging to the S. S. White Dental Manufacturing Company, Philadelphia, Pennsylvania. They were on paper the same size as the *Cosmos,* which was a little larger than that of the Austro-Hungarian dental journal, so they have been cut down to conform with the latter in Quintero's volume. The *Transactions* close with a list of officers and members of two committees, together with a list of forty-five ordinary and three honorary members as of July, 1914.

I will refer briefly to the *Transactions* since 1914. There was no meeting until 1922; the *Transactions* for that year and for 1923 were bound in one volume printed and published by the Dental Manufacturing Company of London, who continued this function until 1930. Those for 1932, the occasion of a joint meeting with the French Society, appeared as reports in French and English printed in Lyons by the same publishers as the French Society's *Transactions.* From 1932 to 1938 the printing was again done by the Dental Manufacturing Company; during this time many papers appeared in the *Dental Record.* Sometime between 1938 and 1947 the Dental Manufacturing Company sold the *Dental Record* (later taken over by the *Dental Practitioner*), so the E.O.S sought new publishers. The account of the twenty-third meeting, held in Bonn and Wiesbaden from July 3 to July 6, 1939, is issued in the form of reports, papers, and demonstrations (personal summaries) in one volume in German, English, French, and Italian. I believe that these, printed in Germany, were issued separately for each language, and I have the impression that they were sent to members before the meeting.

Drukkerij Albani of the Hague, Holland, were appointed printers and publishers to succeed the Dental Manufacturing Company, as the cost was less in Holland than in England. The first *Transactions* printed by the new firm

were for 1947 and 1948, the two years being in one volume (see Editorial on p. 1 and note headed "Brussels 1947" on p. 3). The House of Albani continued the practice started in 1935 by the Dental Manufacturing Company of using a blue cloth binding.

The Society has always been well served by its officers. They have an unusually difficult task, with so many languages to deal with, and we are fortunate in that we have had and still have some who are at least bi-lingual.

I am indebted to Professor Sheldon Friel for information and for the loan of his *Transactions*, to the Hon. Secretary for the loan of *Transactions*, and to Miss Horton and officers of the British Dental Association Library. It has not been easy to unravel some of the details. I would suggest that a historian be appointed so that it will not be so difficult to write a review at the end of the next fifty years.

Appendix 1

*E.O.S. Transactions: Contents of Prof. Friel's Vol. 1, 1907-1908**

Law, Wm. G.: The Retention of Class II Cases: Staple and Hook Sectional Retainer (in English), read at the first meeting, September, 1907, Am. Orthodontist **1**: 182-187, 1908 (photostatic copy).

pp. 144-150 Three-page announcement by William G. Law, which gives the following information:

Berlin, Sept. 27 and 28, 1907.
E. D. Barrows, Berlin.
Wm. G. Law, Berlin.
George Kennedy, Berlin.
Jane Bunker, Berlin.
J. Grünberg, Berlin.
Axel Lundström, Gothenburg.
Watling, Berlin.
Zelinska, Vienna.
J. J. Giusti, Leipzig.
Pfluger, Hamburg.
This is followed by a three-page communication (in German), probably from Angle.

pp. 151-160 Grünberg, J.: Horizontal Curve of Dental Arches (in German).
pp. 160-164 Kennedy, G.: Orthodontia in Europe (in German).
pp. 164-174 Law, Wm. G.: Retention of Class II (in German).
pp. 174-179 Lundström, A.: Prosthesis v. Extraction (in German).
pp. 179-185 Lundström, A.: Characteristic Outline of the Bite (in German).
p. 536 Program for the second meeting, Sept. 25 and 26, 1908 (in German).
p. 417 Notice (in German), dates of Oct. 2 and 3 mentioned.
p. 275 Notice (in German), dates of Oct. 2 and 3 mentioned, signed W. G. Law (? for arranging meeting in Wiesbaden, April 7, 1909).
p. 130 Law, Wm. G.: President's Address, European Orthodontia Society (in English), Am. Orthodontist **1**: 130, 1908.
p. 132 Grünberg, J.: Horizontal Curve of Dental Arches (in English), Am. Orthodontist **1**: 132, 1908.
pp. 140-146 Lundström, A.: Distinctive Features of Masticating Dentures as Demonstrated by Comparative Occlusion (in English), Am. Orthodontist **1**: 140-146, 1908.

**Note:* The page numbers on the left are those of the journal in which the articles appeared; hence, the irregularity of sequence.

Appendix 2

The American Orthodontist
Papers read at E.O.S. Meetings and other E.O.S. matter

Vol. 1, No. 2, October, 1907: Editorial refers to E.O.S.

Vol. 1, No. 3, May, 1908: President's Address, W. G. Law, Berlin, September, 1907.
The Horizontal Curve of the Dental Arch, J. Grünberg, Berlin, September, 1907.
The Distinctive Features of Masticating Dentures as Demonstrated by Comparative Occlusion, Axel Lundström, Goteborg, read in Berlin, 1907.

Vol. 1, No. 4, August, 1908: Retention of Class II Cases—Staple and Hook Sectional Retainer, W. G. Law, Berlin, September, 1907.

Vol. 2, No. 3, January, 1911: Notice regarding the Angle School, mentioning Grünberg as superintendent and as teacher of applied orthodontia.

Vol. 3, No. 2, pp. 88-93, October, 1911: The Shifting of the Teeth Into Normal Angle of Inclination, J. Grünberg (reprinted from *Oesterr.-ungar. Vrtljschr. f. Zahnh.*, October, 1910). (Read at Wiesbaden, April, 1911.)

Vol. 3, No. 2, pp. 94-99, October, 1911: The Working Retainer in the Therapeutics of Class II, Albin Oppenheim, Vienna (reprinted from *Oesterr.-ungar. Vrtljschr. f. Zahnh.*, April, 1911). (Some question as to whether this was read at E.O.S. meeting, as it does not appear in the E.O.S. *Transactions.*)

Vol. 3, No. 3, p. 144, January, 1912: The Causes of Progressive Movement of the Teeth Toward the Front, Franz Trauner, Graz (reprinted from *Oesterr.-ungar Vrtljschr. f. Zahnh.*, 1910). (This paper was read at the fourth meeting in October, 1910, and appears in the E.O.S. *Transactions* published in April, 1911, so there is some question as to its listing in the *American Orthodontist* in 1910.)

Vol. 3, No. 4, October, 1912: Report of the fifth annual E.O.S. meeting held in Brussels, 1912; subjects discussed were the dynamics of dental arch and dental arch expansion during shedding of the teeth, among others. "The articles will appear in English and German in *Oesterr.-ungar. Vrtljschr. f. Zahnh.*, and in French in *La Province Dentaire.* An important feature of the meeting was the discussion in which it was held that in Class II cases the upper first molars should not be tipped distally but held in a stable position."

Appendix 3

Facsimile of the cover page of the Transactions of the Sixth Meeting, 1913 the first occasion on which the Transactions were printed in one volume.

TRANSACTIONS
of the
EUROPEAN ORTHODONTIA SOCIETY
Sixth Annual Meeting
London, May 11th to 14th 1913
— o O o —
VERHANDLUNGEN
der
EUROPÄISCHEN GESELLSCHAFT
für ORTHODONTIE
VI. Jahresversammlung
London, 11. bis 14. Mai 1913
— o O o —
Herausgegeben von der
"Oesterr.-ungar. Vierteljahrsschrift für Zahnheilkunde"
Wien, 1. Petersplatz 7.

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E.O.S. = European Orthodontic Society. Heft = Issue.

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2. Anema, R.: The Growth of Orthodontia (President's Address), Tr. E.O.S., 1914 (published, 1917), p. 7.
3. Bogue, E. A.: Beauty v. Health in Children, Tr. E.O.S., 1913, p. 235.
4. Bunker, Jane: Post Office Address listed in Am. Orthodontist **2**: 57, 1910.
5. Bunker, Jane: Models Showing Correct Median Line, Am. Orthodontist **3**: 86, 1911.
6. Chapman, Harold: The Teaching of Orthodontia in Dental Schools, Tr. E.O.S. (published April, 1910, by Julius Weiss, Vienna).
7. Coebergh, P. J. J.: The Normal Dental Arch, Tr. E.O.S., Heft 11, October, 1912.
8. Davenport, K. A.: Tr. E.O.S., 1913, p. 3.
9. Davenport, I. B.: Tr. E.O.S., 1914, p. 5.
10. Dewey, M.: Am. Orthodontist **2**: 51, 1910.
11. Grünberg, J.: Plain Bands in Orthodontia, Tr. E.O.S., Heft 1, 1909.
12. Grünberg, J.: Horizontal Curve of Dental Arches, Am. Orthodontist **1**: 132, 1908 (see Appendix 1).
13. Grünberg, J.: Am. Orthodontist **2**: 163, 1911.
14. Grünberg, J.: President's Address, Tr. E.O.S., 1910, p. 205.
15. Kennedy, G. A.: Die Zukunft der Orthodontie in Europa, Tr. E.O.S., 1908, p. 160 (see Appendix 1).
16. Law, W. G.: Presidential Address, Am. Orthodontist **1**: 130, 1908.
17. Law, W. G.: Retention of Class II Cases: The Staple and Hook Sectional Retainer, Am. Orthodontist **1**: 182, 1908.
18. Lundström, Axel: Distinctive Features of Masticating Dentures as Demonstrated by Comparative Occlusion, Am. Orthodontist **1**: 140, 1908.
19. Lundström, Axel: Prothese gegen Extraktion, Tr. E.O.S., 1907-8, p. 174 (see Appendix 1).
20. Lundström, Axel: Die Charakteristischen Grundzüge von Gebissen, Tr. E.O.S., 1907-8, p. 179 (see Appendix 1).
21. Lundström, Axel: Malocclusion of the Teeth Regarded as a Problem in Connection With the Apical Base, Stockholm: Svensk Tandläkare Tidskrift and "Festskrift" 1923; Int. J. Orthodontia **11**: 591, 724, 933, 1022, 1925.
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    The Results of Extraction, Friel's Tr. E.O.S., 1909, taken from *Dental Record* **29**: 331, 1909.
23. Oppenheim, Albin: Tissue Changes, Particularly of the Bone, Incident to Tooth Movement, Tr. E.O.S., Heft 8, 1911; Am. Orthodontist **3**: 57, 1911.
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27. Wilson, H. E.: Myofunctional Appliances, Tr. Soc. franç. dento-facial orthopédie, 1953, p. 301.

A LONGITUDINAL STUDY OF OCCLUSION AND TOOTH ERUPTION IN RELATION TO SKELETAL MATURATION

JAGDISH K. BAMBHA, B.D.S., AND PEARL VAN NATTA, M.A., DENVER, COLO.

INTRODUCTION

MALOCCLUSION presents itself in a great variety of forms. The underlying causative factors are equally varied and complex. For many years investigators have laid emphasis on the question of underlying cause, striving for a better understanding of the individual and his complex structure as a whole rather than considering the teeth as a separate part of the body. Multiple factors, local and general, prenatal and postnatal, influence the teeth and the jaws.[5] Under these circumstances, a better understanding of the conditions relating to the jaws, including their relationship to skeletal and physical growth, is desirable, since many malocclusions may be associated with skeletal disharmonies.

The incentive for this investigation of the relationship between malocclusion and skeletal maturation is a statement by Krogman[6]: "There is reason to believe that a higher rate of malocclusion and more severe cases (the Class II, Division 1 cases, for example) are to be found in maturational laggards." Such a statement is made on the assumption that lags or gains in the development of the jaws from what one would expect at any particular age are in the same direction and magnitude as the lags and gains in the maturation of the epiphyses of hand and wrist.

If skeletal age minus chronological age is negative, then we call the difference a skeletal lag; if positive, we call the difference a skeletal gain.

SKELETAL MATURATION AND OCCLUSION

The subjects composing this particular population are twenty-eight boys and thirty-two girls who have been enrolled in the Child Research Council, which is affiliated with the University of Colorado School of Medicine in Denver, Colorado. The program and the nature of records being maintained at the Child Research Council have been discussed by Waldo[9] and Washburn.[10] The present study is restricted to the period between the ages of 3 and 16 years on each child. The hand and wrist x-rays were considered for the period from 3 to 13 years and the dental casts for the period from 12 to 16 years. The skeletal age was determined by staff roentgenologists from x-ray films of the hand and

From the Child Research Council and the University of Colorado School of Medicine. Supported in part by grants from the Commonwealth Fund of New York.

wrist taken at intervals of six months.[4] The number of x-ray pictures available for evaluating the bone age for a given child ranged from eleven to twenty-five. Angle's classification was used to classify the occlusion of every child at each annual dental examination as normal occlusion, Class I malocclusion, or Class II, Division 1 and Division 2 malocclusion.[1] No children in this study had Angle Class III malocclusion. The two classes were further divided into three categories, depending upon the severity of malocclusion, with category 1 the least severe, category 2 moderately severe, and category 3 the most severe. Cases of Class I malocclusion were placed in categories 1 and 2. Class II cases were divided as follows: Those cases in which the mandible was one-half cusp distal were placed in category 1, cases with one-half cusp to one cusp distal were placed in category 2, and cases in which the mandible was more than one cusp distal were placed in category 3. In certain cases the severity rating had to be modified by the over-all evaluation of the teeth and jaws. Children who had had teeth extracted were excluded from the study. Clinically, no evidence of oral habits could be recognized.

The decision to treat skeletal gain or lag as an entity for an individual resulted in a rating for each person of timing of skeletal maturation. The continuum which is formed by the timing of skeletal maturation (based on skeletal gain-lag) was divided into segments called early, average, late, and very late. The criteria for individual placement into one of these groups were (a) value of the median of the distribution of lags and gains and (b) value of the extreme lag or gain. Table I gives the criterion values and group sizes.

TABLE I

TIME OF SKELETAL MATURATION	NUMBER IN GROUP	RANGE OF OBSERVED MEDIANS IN MONTHS	RANGE OF OBSERVED EXTREME VALUES IN MONTHS
Early	3	14 to 18	18 to 42
Average	31	− 9 to + 9	−12 to +12
Late	14	−15 to − 9	−27 to −15
Very late	12	−30 to −18	−36 to −24
Total	60		

The hypothesis that the true rate of malocclusion for the average, late, and very late skeletal maturation groups is .60 was tested by using Bartlett's angular transformation on the proportions and computing a chi-square value.[3] Each proportion was tested against the proportion of maloccluded, .60, found in a survey at the Guggenheim Dental Clinic in New York City and quoted by Strusser and Simon.[8] The proportions of maloccluded children in this study are .613 for the group of thirty-one with average time of skeletal maturation, .786 for the group of fourteen with late skeletal maturation, and .667 for the group of 12 with very late skeletal maturation. The value of chi-square is 2.36 with 3 degrees of freedom, which is nonsignificant. Thus, these data provide no evidence that the rate of malocclusion in any of the skeletal maturation groups, particularly the very late skeletal maturation group (laggards), differs from the expected value.

The possibility that severity of malocclusion and time of skeletal maturation may be associated was also investigated. There are several statistical tools that one may use to estimate the strength of an association between two variables. However, the ridit analysis technique developed by Irwin Bross[2] used in this study represents an attempt to place severity of malocclusion on a numerical basis in a way that allows statements about the strength of an association to be comparable over time and changing investigators. Ridits represent a type of transformation of the response, the response variable being severity of malocclusion. Ridits are of the same family as probits, with the ridit transformation differing from the probit transformation in that probits are relative to a theoretical normal distribution, whereas ridits are relative to an empirical distribution, namely, the observed distribution of a response variable for a specified group of individuals. The first three letters of the word *ridit* stand for "relative to an identified distribution." The identified distribution here is the distribution into the four categories of rating of severity of malocclusion of the thirty-one children who comprise a group with average time of skeletal maturation.

TABLE II. COMPUTATION OF RIDITS

CATEGORIES OF SEVERITY OF MALOCCLUSION	1	2	3	4	5 (RIDITS)
0	10	5.0	0	5.0	.161
1	10	5.0	10	15.0	.484
2	8	4.0	20	24.0	.774
3	3	1.5	28	29.5	.952
Total	31				

Column 1 = The frequency distribution in the identified distribution.
Column 2 = One-half of the corresponding entry in Column 1.
Column 3 = The cumulate of Column 1 (displaced one category downward).
Column 4 = Column 2 plus Column 3.
Column 5 = The entries in Column 4 divided by grand total 31. The numbers are the ridits.

The ridit for any rating category is the sum of the number of persons with less severe malocclusion than that rating plus one-half the number of persons in the rating category itself expressed as a proportion of the total group. For instance, the ridit .484 computed in Table II for rating 1 is the number of persons (ten) with rating 0, plus one-half the number of persons (five) in rating 1, divided by 31 (15/31 = .484). The ridit .774 computed for rating 2 is the number of persons (twenty) with rating 0 or rating 1, plus one-half the number of persons (four) in rating 2, divided by 31 (24/31 = .774).

We can associate with each of the sixty children in this study a number (ridit) which serves as a measure of his severity of malocclusion. In order to estimate the probability that a person in the group with, for instance, very late time of skeletal maturation will attain more severe malocclusion than a person in the control group, we compute the average ridit for the group with very late time of skeletal maturation. Table III gives the average ridits for the three maturation groups.

In order to illustrate what is meant by the "average ridit," we may take the average ridit .63 obtained for the late skeletal maturation group as an example. Let us imagine ourselves picking a person at random from the control group and a person at random from the late skeletal maturation group. We examine the severity of malocclusion of the two children to determine which of them has the more severe malocclusion. We repeat this many times, and the proportion of cases in which the child in the late skeletal maturation group has greater severity of malocclusion than the child in the control group is the probability that we are estimating by the number .63. The definition of a ridit ensures that the average ridit for the control group will always be .50.

TABLE III. AVERAGE RIDITS AND CONFIDENCE INTERVALS WHEN RESPONSE VARIABLE IS SEVERITY OF MALOCCLUSION

SKELETAL MATURATION GROUPS	NUMBER IN GROUP	AVERAGE RIDIT	95% CONFIDENCE LIMITS FOR THE AVERAGE RIDIT
Control	31	.50	.40 to .60
Late	14	.63	.47 to .80
Very late	11*	.52	.32 to .72

*One child has insufficient records on which to base a rating of severity of malocclusion.

Each average ridit is a probability statement for that group. We would like to know what the probability is that the average ridit is a true statement of probability. Using our former example, we say that there are sixty-three chances in 100 that a person picked at random from the late skeletal maturation group will have a more severe malocclusion than a person picked at random from the control group. What confidence can we place in this statement? Estimates of the 95 per cent confidence limits for the average ridit are the observed average ridit ± twice the standard error of the average ridit. Fig. 1 shows the relative positions of the confidence intervals for the three groups. If the confidence interval for the average ridit of a group were to lie entirely above or entirely below the confidence interval of the control group, then this would be evidence that the group differed significantly in severity of malocclusion from the control group. The length of the confidence interval depends on the group size. Thus, while with the amount of data available for this study there is no evidence that any of the groups differ from one another in severity of malocclusion, the accumulation of more data would be advisable before final conclusions are drawn.

It should be noted that the time of skeletal maturation for each child was unknown to the author who made the severity of malocclusion ratings at the time that he made the ratings, and that his severity ratings for the group with average time of skeletal maturation are compared with his severity ratings for the other two groups. In future years, when more data will be available, if there should be a different investigator who wishes to repeat this study, he may do so with comparable results for, although his ratings of severity of malocclusion may differ from those of the present investigator, he will be testing his ratings of one group against his ratings of another group and not against the ratings of the present investigator.

There was not a large enough group of children with dental examinations every year to warrant an attempt to determine what, if any, effect a lag or gain in skeletal growth has on malocclusion at that time or in the immediately succeeding time period. However, the possibility was considered that the distribution of skeletal gain or lag would differ for the normal occlusion period of the group of children who attained malocclusion after 10 years of age (Group 1) as opposed to the corresponding normal occlusion period of the group of children who remained in normal occlusion (Group 2).

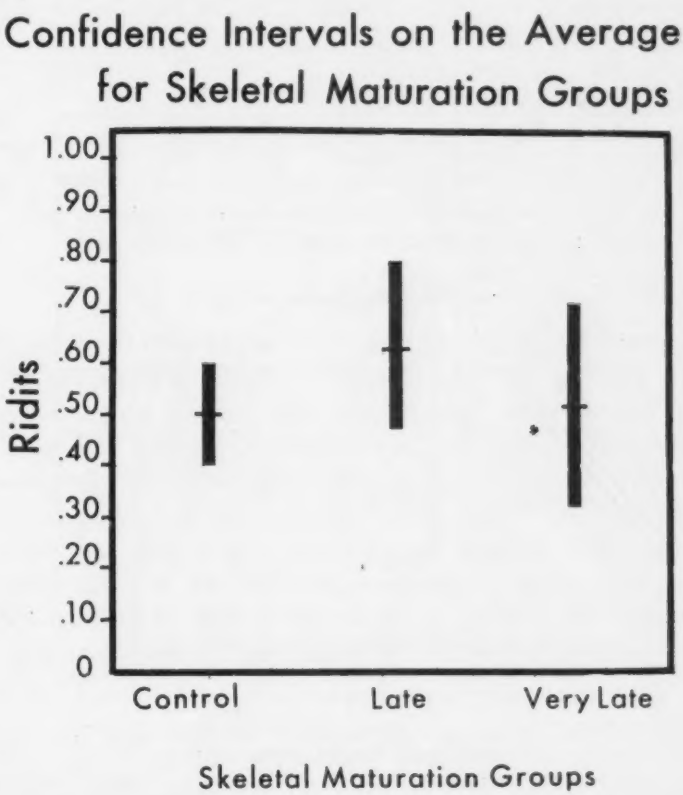

Fig. 1.—The bar in the center of each confidence interval is the average ridit for that group.

In order to investigate such a possibility, the following procedures were carried out on the two groups. Ten determinations of skeletal lag-gain obtained for each child between the ages of 3 and 10 were classified into two categories: (1) lag of twelve months or less and (2) lag of thirteen months or more. Since it was necessary to have the same number of determinations on each child, the ten closest to the age of 10 were chosen. It seemed reasonable to have age 10 as the cutting point, since differential puberal effects generally would not be operating. For each child the proportion of skeletal age determinations which showed lags of thirteen months or more was transformed by means of the angular transformation, with adjusted values obtained from Table 16.4 of Eisenhart's[3] chapter used for proportions 0 and 1. Transformation of the

proportions is necessary since the variance of an observed proportion depends on the true proportion that it estimates. Table IV shows that the two groups are very much alike in the distribution of proportions of lags of more than twelve months.

TABLE IV. DISTRIBUTION OF PROPORTIONS OF SKELETAL LAGS WITH MAGNITUDE GREATER THAN TWELVE MONTHS FOR TWO GROUPS

PROPORTION	GROUP 1		GROUP 2	
	FREQUENCY	PHI IN RADIANS	FREQUENCY	PHI IN RADIANS
0	7	0.3176	9	0.3176
0.3	1	1.0600		
0.5			3	1.5700
0.6			1	1.7740
0.7	2	1.9800		
0.8	1	2.2120		
1.0			2	2.8240
Totals	11	9.4552	15	14.9904
Mean phi		.8596		.9994

Group 1 consists of children who attained malocclusion after 10 years of age.
Group 2 consists of children whose occlusion remained normal.
Phi equals 2 arcsin $(\sqrt{\text{proportion}})$
Theoretical variance of phi for sample size 10 is 0.1126.

This can be tested by computing the ratio of the square of the difference between the mean phi's of the two groups to the theoretical variance of the difference between means. The value of this ratio is 1.101 which, when referred to a table of the integral of the chi-square distribution with 1 degree of freedom, gives a probability of .27 of exceeding this value when all the persons come from the same population. These data indicate that the mean proportion of skeletal lags of magnitude greater than twelve months does not differ for the two groups. The wide range of proportions observed in both Group 1 and Group 2 suggests that the persons in neither group can be said to come from a population with a specified proportion of large lags. A statistical test of this is unnecessary.

TABLE V. AVERAGE RIDITS AND CONFIDENCE INTERVALS WHEN RESPONSE VARIABLE IS TIME OF SKELETAL MATURATION

TIME OF TOOTH ERUPTION GROUPS	NUMBER IN GROUP	AVERAGE RIDITS	95% CONFIDENCE INTERVALS FOR THE AVERAGE RIDIT
Control	33	.50	.41 to .59
Early	17	.51	.38 to .64
Late	10	.62	.46 to .78

SKELETAL MATURATION AND ERUPTION OF TEETH

From the data collected on tooth eruption at the Child Research Council, frequency curves were drawn for each of the deciduous and permanent teeth.[7] The onset and the end of each ogive on the time scale indicate the length of time taken for a tooth to be present in 100 per cent of the children. The time of eruption of each individual tooth was plotted on the graph, on which lines were drawn marking the twenty-fifth, fiftieth, and seventy-fifth percentiles. If 75 per cent or more of a person's teeth fell above the seventy-fifth percentile, that person was placed in the late-eruption group. Similarly, if 75 per cent or more

of a person's teeth fell below the twenty-fifth percentile, that person was placed in the early-eruption group. All other persons were placed in the average-eruption group. Fig. 2 illustrates an example of one Child Research Council girl (No. 106) with average time of eruption of teeth.

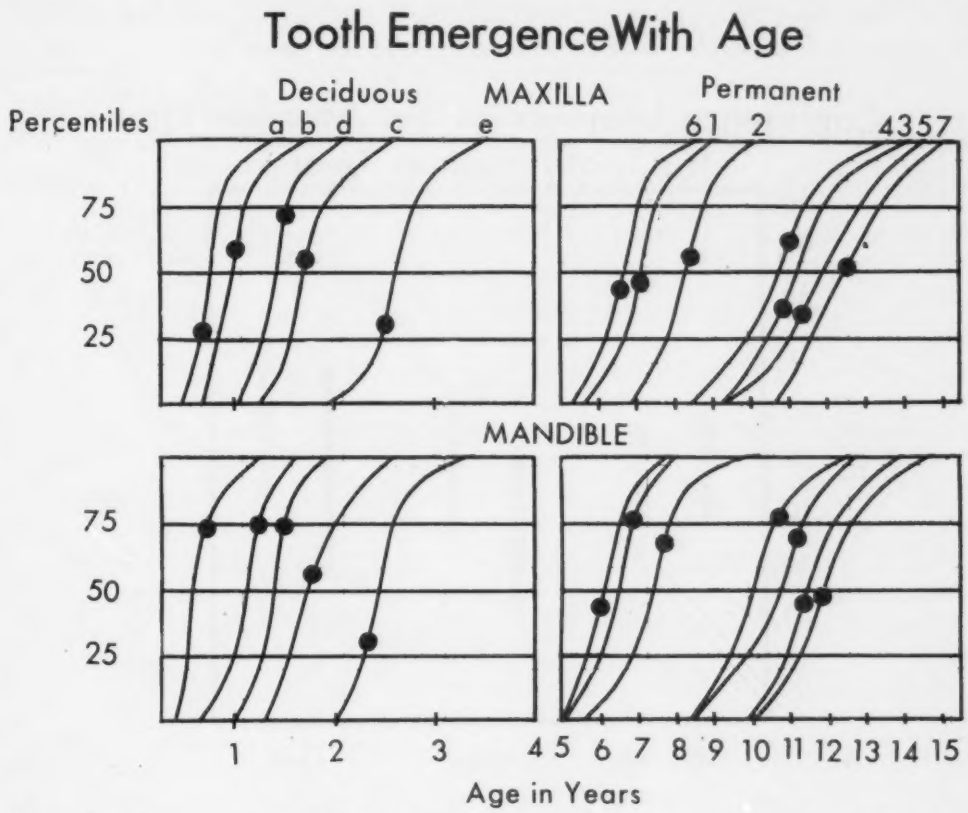

Fig. 2.—Tooth eruption times for Child Research Council girl No. 106, plotted on ogives drawn from Child Research Council data (girls).

To test association between time of skeletal maturation and time of eruption of teeth, ridit analysis was again used, with time of skeletal maturation as the response variable and the group with average time of eruption of teeth as the control group. Table V gives the average ridits for the three tooth-eruption groups, and Fig. 3 shows the relative positions of the confidence intervals.

TABLE VI. AVERAGE RIDITS AND CONFIDENCE INTERVALS WHEN RESPONSE VARIABLE IS SEVERITY OF MALOCCLUSION

TIME OF TOOTH ERUPTION GROUPS	NUMBER IN GROUP	AVERAGE RIDITS	95% CONFIDENCE INTERVALS FOR THE AVERAGE RIDIT
Control	33	.50	.40 to .60
Early	16	.39	.24 to .53
Late	10	.50	.29 to .71

There is no evidence that any of the groups differ from one another with respect to time of skeletal maturation; the reservation about the smallness of the group also applies here.

OCCLUSION AND ERUPTION OF TEETH

Similar computations were done to check on the possibility that time of eruption of teeth and severity of malocclusion may be associated. The response variable was severity of malocclusion, and the control was the group of children with average time of eruption of teeth. Table VI gives the computed information, and Fig. 3 shows the relative positions of the confidence intervals.

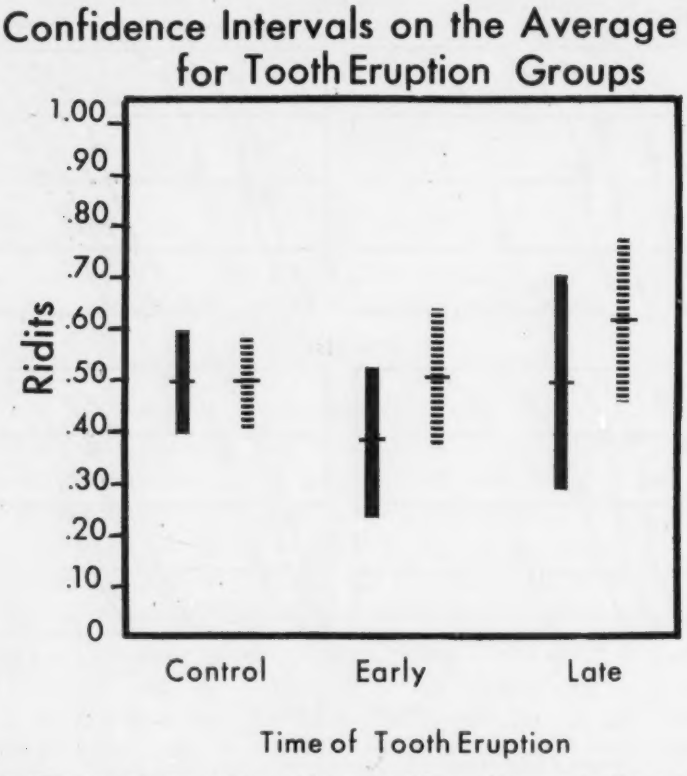

Fig. 3.—The bar in the center of each confidence interval is the average ridit for that group. The confidence interval is a solid line when severity of malocclusion is the response variable and a striped line when time of skeletal maturation is the response variable. Comparison of confidence intervals is possible only within the solid-line set of intervals and within the striped-line set. The ridits for severity of malocclusion ratings are .121 for rating 0, .409 for rating 1, .697 for rating 2, and .909 for rating 3. The ridits for time of skeletal maturation are .030 for early, .333 for average, .712 for late, and .909 for very late.

CONCLUSIONS

Analysis of longitudinally accumulated data on sixty children followed at the Child Research Council makes possible the following tentative statements concerning the possible relationships between skeletal maturation, occlusion, and tooth eruption:

1. There is no evidence of higher rates of malocclusion in maturational laggards.
2. There is no evidence of more severe malocclusion in maturational laggards.
3. There is no evidence of association between time of tooth eruption and time of skeletal maturation or between time of tooth eruption and severity of malocclusion.

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THE TASK OF THE ORTHODONTIST VIEWED FROM A BIOLOGIC STANDPOINT

PROF. DR. A. M. SCHWARZ, VIENNA, AUSTRIA

TYPICAL malocclusions are not caused by disease but are the result of two factors working together: a devious hereditary disposition (probably a mutation) and an abnormal environment which promotes and intensifies the hereditary disposition. The foremost of the external influences upon the hereditary tendencies is function. The simple formula for such anomalies is as follows: hereditary disposition + corresponding environment = malocclusion.

In order to understand our task in treating these irregularities in a biologic sense, we may compare the treatment of the abnormally developing, growing jaws with the education of children.

What is the first task of a pedagogue? To promote out of the mass of mental or psychic hereditary qualities slumbering in every child all that are socially useful and to suppress the socially harmful or dangerous ones. The family, school, church, good company, sport, good reading, and also the cinema and theater contribute to this environment by featuring the valuable and condemning the harmful qualities. In this way we are usually successful, and this is the foundation of all our social institutions. However, there are also failures in this first and most important period of education, caused either by insufficiency of the benign environment in the presence of extraordinarily strong abnormal hereditary tendencies or by bad environment (seductive, demoralizing companionship, disordered family life, and so on). For the late education of such socially harmful elements, the criminal courts are competent. Even imprisonment as a brutal educational help for adolescents is often successful.

I am convinced that we orthodontists have to face a very similar problem, as is already suggested by the other name of our profession—jaw orthopedia. This Greek-derived term means "education."

As mentioned above, there is an abnormal (devious) hereditary disposition. Besides that one which is manifest because of a favorable environment, there are still several other dormant or suppressed tendencies. Among the latter is the hereditary disposition of the sound normal dentition, which is only awaiting the favorable opportunity from the external world to become manifest.

The clearest proof of the existence of hidden, slumbering hereditary qualities in addition to the one manifest in the same person is the fact that these qualities often jump one or even more generations. Obviously, they must have

been transferred by the connecting (intermediate) generation. If, for instance, mandibular prognathism of the grandfather reappears in a grandchild, the child's father must have had the same latent malocclusion, even though his dentition was normal.

The consequence of this is that the appearance of every detail of a living organism is not the result of only one existent hereditary tendency, but out of a number of different dispositions only one could become manifest, namely, the one which best corresponds to the given environment.

This interpretation is proved true by the modern philosophy of constitution and genetics. As is well known, this science differentiates between the *phenotype* (the manifestation of the hereditary type as modified by external influences, forming the individual appearance) and the *genotype* (the whole of the genetic potential). According to Saller,[4] besides these two types there exists the so-called *kryptotype*. This third type comprises a series of suppressed tendencies and dispositions which still have their development in front of them. They can develop from the genotype to the phenotype, but only if activated by favorable environmental influences. Saller calls this changing of the phenotype the "remodelling of the constitution." It can occur during the entire lifetime of the individual, although decreasing with age, *even if the reaction directed by the genes runs in a different way.*

This gives the orthodontist a great opportunity. If we make fundamental alterations in the devious environments early enough, we shall succeed in most cases in suppressing the temporarily manifest undesirable hereditary quality and promote another, more desirable one which will persist throughout the rest of the patient's life.

What, exactly, do we do by putting an appliance in the mouth of a child? The answer is that *we interfere with different contesting hereditary tendencies that are competing to become manifest,* one of which, a devious one, has gained a passing advantage. The rivalry is not yet definitely decided. We interfere with the act of selection when we use the orthodontic appliance to change the external conditions in favor of the normal dentition.

Thus, the appliance plays the role of the pedagogue of the growing jaw. Depending upon the different appliances and the ability of the dentist, this pedagogue is in some cases crude, like a rude attendant in a reformatory beating and striking. In other cases it is like a sensitive teacher who stimulates his pupils by words of praise only and reproaches them just by frowning. An example of the latter kind of pedagogue is the F.K.O.* appliance. The active plate represents all transitionary modulations between gentle and severe, but as a removable appliance it never attains the severity of the former type of pedagogue.

This point of view enables us to answer very easily many questions to which there was no satisfactory reply until now. For instance, we ascertained every environmental force causing typical anomalies, but such forces are not able to create the respective anomaly in every case. In the most frequent example, thumb-sucking, the simple explanation is that an inherited tendency toward a

*F.K.O. stands for the "Funktions-Kiefer-Orthopädie" of Andresen and Häupl,[1] its appliance being the Monobloc activator.

narrow maxilla will flourish under the favorable environmental influence of thumb-sucking, severe additional deformations will result, and the anomaly will persist even after the habit has been broken. On the contrary, if the child has inherited a broad jaw with a normal-shaped dental arch, even an intensive sucking habit will produce only a temporary deviation at most, and this will relapse to the normal soon after the habit has been stopped. We can say in this case that the sucking habit was unsuccessful, and now we know the reason for the failure. The same conditions exist with respect to all the other kinds of outer forces and environments such as mouth-breathing, pathologic swallowing, and adenoids (whose influence has been greatly overrated heretofore). There are several questions that might be asked in all such cases. For instance, if pathologic swallowing causes a narrow jaw, why does it not do so in every case? If sucking causes the upper protrusion, how can such protrusion develop in the absence of a sucking habit? The answer to such questions is that if the hereditary tendency runs in the same direction as the environment, the typical full, persistent malocclusion results. If environmental forces are directed contrary to the hereditary tendency the latter is frequently the victor. We see this in cases of Class II, Division 2 malocclusion in children who suck their thumbs. The hereditary fixed steep position of the upper front remains, but the open-bite disappears after the habit has been discontinued.

Andresen has compared the effect of his activator with the effect of thumb-sucking. This comparison is quite appropriate, for the activator is also unable to protrude the steep-posed upper front of a Class II, Division 2 malocclusion. The activator is too gentle an "educator" to correct the steep-bite. This anomaly needs a more rigorous "teacher" to repress the abnormal hereditary tendency in favor of the normal. This example also answers the question as to why, when treating two apparently equal cases, we have full success in one but not in the other. The relative intensity of the hereditary tendency as compared with that of the artificially changed environment (the effect of the appliance used) is decisive.

This description reveals the fundamental contrast in the biologic thinking of orthodontists in the United States and European orthodontists. The American thinks that the "education" is finished with *birth*, whereas we Europeans say that it is finished with *death*.

Applied to our profession, this means that in the American orthodontist's opinion the final form of the whole dentition is, like the shape of the tooth crowns, already definitively determined at birth. Therefore, he is left with a very small field for treatment which involves transforming the alveolar bone artificially by force only. Consequently, he is afraid of disturbing the directed growth by early treatment of the deciduous or mixed dentition during the time of its most impetuous development and prefers to treat the permanent dentition. For the same reason, he is afraid to expand the jaws and doubts the possibility of moving the entire mandible forward out of a Class II occlusion, and so on.

The European orthodontist, on the other hand, believes that he must start treatment during that period of turbulent growth, trying to bring the favorable

hereditary tendencies to the fore. He is convinced that this is the best time for successful treatment. He rejects appliances that work only on a tooth and its alveolar bone. Instead, if possible, he uses devices which simultaneously influence all aspects of the malocclusion in two ways: (1) by gentle stimulation to transform the jaws in the direction of the desired hereditary tendency and (2) by radical change of function in the same sense, the function being the best-proved promoter of the hereditary tendencies being sought.

It has appeared, to our most joyful surprise, that these appliances, which are worn only at night, for stimulating growth and changing function are successful even in treating malocclusions of doubtless hereditary origin (for example, the Class II, Division 2 malocclusion or mandibular prognathism).

This discovery opened the way for the development of a kind of orthodontics that is new in two chief respects:

1. *Orthodontics has become a genuine orthopedics of both whole jaws.* It is now possible to avoid moving single teeth by means of permanent and bodily acting forces which are so dangerous to tooth roots. Thus, we can meet the foremost requisite of medical science—*primum non nocere*. Millions of successfully treated cases prove the correctness of our procedure and at the same time indicate the second, and most satisfactory, way in which orthodontics has changed.

2. *Orthodontics has expanded to a socially valuable status* thanks to the new, less expensive methods of treatment, which can be studied by the general practitioner of dentistry as well as by the orthodontic specialist.

This new kind of orthodontics is considered dentistry's best prophylaxis against early tooth decay with all its dangers to the health of mankind. Therefore, in several European countries the government provides a part of the means for such treatment.

Such a development was previously thought to be a dream of the older generation of dentists which would hardly ever be realized. Still, it came true in countries impoverished by two lost world wars. The victorious and rich United States of America might have misunderstood this coincidence as an adaptation to poverty and therefore underestimated it. I would be pleased if this article could help dispel any such misapprehension.

Biologic views at first were the guiding thread in the creation of the modern European orthodontics. The fact that the new treatment was inexpensive and could be easier learned was just a lucky coincidence and a great help in our poverty.

In closing, I want to extend my thanks to Dr. W. Grossmann, head of the Orthodontic Department at the University of London. In his last paper, he agrees not only with my ideas, which were first developed in my textbook published in 1944, but he speaks of them as if they would be long accepted as common property of our profession. It will make me happy if that should be the case.

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Editorial

SPECIALIZATION AND SPECIALTY BOARDS IN DENTISTRY

OF SPECIAL interest to orthodontists is the "Statement of Policy on Special Areas of Practice, Certifying Boards, Diplomates, and Specialists in Dentistry," prepared by the Council on Dental Education of the American Dental Association and adopted by the House of Delegates at the A.D.A.'s centennial meeting in September, 1959, in New York City. The Council now is planning to hold a workshop conference on specialization early in 1960 in order to develop a detailed plan to implement and further spell out its recommendations for presentation to the A.D.A. House of Delegates at the 1960 annual session. The AMERICAN JOURNAL OF ORTHODONTICS already has commented on the activities of the A.D.A. Council.* It is not necessary, therefore, to repeat here in detail the main issues involved.

As stated by our president, Dr. George M. Anderson, before the A.D.A. Reference Committee during the centennial meeting, the policy enunciated by the Council on Dental Education and the views held by the representatives of the American Association of Orthodontists and the American Board of Orthodontics are basically in agreement, although they differ in some important details which are still to be worked out.

In order to realize the full significance of the proposed changes in specialization recommended by the A.D.A. Council and their possible effects on orthodontics as a specialty and on dentistry as a changing profession, we call attention to the following pertinent facts.

The first specialty board in medicine, the American Board of Ophthalmology, was organized in 1917. Its basic philosophy parallels that of the American Board of Orthodontics, the second specialty board to be organized and the first specialty board in dentistry. It was not until 1933 that the American Medical Association took cognizance of specialty boards. Not until 1940, twelve years after the American Board of Orthodontics was formed by the American Association of Orthodontics, did the A.D.A. begin to show interest in specialty boards.

In the forty years since the founding of the first board in medicine, the number of medical boards has grown to nineteen. In addition, there are six

*Dewel, B. F.: A Preliminary Report on the Council on Dental Education's Conference on Dental Specialties and Specialization, AM. J. ORTHODONTICS 45: 600-602, 1959.

Dewel, B. F.: Revised Resolutions of the Council on Dental Education, AM. J. ORTHODONTICS 45: 692-694, 1959.

subspecialties and twenty-eight areas of specific certification, for a total of fifty-three different sets of standards and qualifications approved by the A.M.A. The A.D.A. at present recognizes seven boards. In addition to the American Board of Orthodontics, founded in 1929, there are specialty boards concerned with periodontics (1940), pedodontics (1942), oral surgery (1946), prosthodontics (1946), oral pathology (1948), and public health (1950). Over the years, there have come into existence groups with special interests in certain areas and phases of dental practice. Some of these groups grant certificates of specialization. These and many more are seeking specialist recognition by the A.D.A.

An examination of the statistics on specialties currently recognized by the A.D.A., presented by the A.D.A. Council, reveals some pertinent information for future reference. The American Board of Orthodontics had 516 diplomates (certificants) on Dec. 31, 1958. The Board of Oral Surgery is next in number of diplomates with 404; of this number, 56 were certified in 1957. Periodontics has 225; prosthodontics, 206; pedodontics, 80; oral pathology, 44; and public health, 30. It can be seen that some of the specialties have only an insignificant number of diplomates when related to the number of dentists in practice.

There is a great need in dentistry for areas of special interest to be defined. Some of these rightfully belong within the fold of cognate basic sciences and health service fields but cannot logically be considered true dental specialties. They are to be differentiated from the definite dental specialties which demand specialized knowledge and techniques which can be obtained only after undergraduate education is completed.

Some of the areas of special interest depend on newer techniques and instruments which actually belong within the realm of the family dentist, who should pursue a continuing education in order to keep up with progress in his profession. Other areas depend on pedantic minutiae of related dental study which are so limited in scope as to be of little or no practical value from the standpoint of common clinical usage and public need.

Among the dangers of overspecialization in the field of dentistry is the confusion of the patient who finds that his teeth (he does not think in terms of the stomatognathic complex or even the oral cavity) require too many "cooks."

An important factor which contributes to the growth of specialization, in addition to the laudable desire of professional men to excel in some phase of practice since it is virtually impossible to excel in all fields, is the quest for "status." The general practitioner, who is the backbone of dentistry, feels that his "status" is diminished when he is compared to the specialist. This is an important problem, especially to those responsible for undergraduate dental education.

The basic philosophy of the training of the general practitioner of dentistry must be changed. The general dentist must change from one who deals with the periodic repair of the teeth to one who looks after the maintenance

of the stomatognathic complex throughout life. While some specialist services may have maintenance features, the service of the specialist is largely of a periodic nature.

Specialism in medicine dates back to ancient times; it has always existed, and it shows a constant tendency to increase. It has been pointed out that the growth of specialism in all scientific disciplines has led to semantic blocks, wherein one group cannot understand the working language of the other even in closely related fields which are mutually interdependent. Scientific progress, it is generally felt, is retarded by this impasse. Dentistry, with its increasing tendency toward specialization and fractionation, is no exception to this trend.

The general practitioner should possess a deep and broad understanding of the basic concepts of every phase of dentistry, even if it is not practical that he learn the details of all techniques, theories, and practices involved. The dentist can employ technicians and refer patients to specialists when referral is indicated, as he currently does, but he must have sufficient knowledge himself to recognize when his patients require the services of those engaged in special fields of practice, and he should be able to discuss intelligently with the specialist the extraordinary needs of his patient. They should at least "speak the same language." In this way the dentist can truly serve as "the family dentist," the one practitioner to whom the public looks for continuing dental health maintenance. The general dentist must assume a role similar to that of the family physician.

Turning to present efforts on specialization, we find that the A.D.A. Council on Dental Education recommends: ". . . each board shall conduct periodic reviews to provide assurance that its diplomates continue to meet the qualification standards." It is reasonable to assume that those interested in special practice are more likely to keep up with advancement in their own fields, through their nationwide and regional specialty organizations and local study groups. The general practitioner, unless he is on the staff of a well-run hospital dental department, is more likely to consider continuing education of secondary importance. The *ad hoc* acceptance of dental education by the general practitioner is in need of change. Dental practice is not static. W. E. Turner,* director of the Division of Scientific Activities of the A.M.A., sums up the need for continuing education as follows: "Advances in knowledge have been of such magnitude that the medical school experience alone no longer qualifies a physician to enter practice but, rather, furnishes the initial plateau on which he erects the additional education and training essential to qualification for general practice or specialty."

Mitchell and Banks** set forth the purposes and functions of a specialty in medicine. These are essentially the same as those established by the A.D.A. Council, namely:

*Turner, E. L.: Maintenance of Standards in Graduate Medical Education, J. A. M. A. **170**: 310-314, 1959.

Mitchell, John M., and Banks, S. W.: Workshop Conference on Specialization. 2. The Specialty Board," J. A. M. A. **170: 315-316, 1959.

> Protection of the health and welfare of the public; special knowledge and skills requiring intensive study and extended clinical and laboratory experience beyond the accepted undergraduate training; established university courses for post-graduate education and experience; public and professional need for such special services; and a sizeable number of practitioners already in it; general practitioners are currently referring patients; and a significant number of practitioners are devoting full-time practice to the special field, and a significant number of scientific papers, of high quality, and clinics have been presented.

With regard to the duties of certifying boards, Mitchell and Banks point out that the board can certify only that the candidate has fulfilled the training requirements, that he has been recommended by his peers, and that he has passed the examination of the Board. This is as far as a board can go. Boards should not consider themselves to be licensing bodies. Certificates granted by boards are more in the nature of evidence that a certain background of experience and ability has been achieved by the person who has passed an examination at a given time.

The A.D.A. Council would allocate additional supervisory powers to specialty boards. Whether or not these would prove practical remains to be seen. Furthermore, the details are still to be determined.

Regulation of specialties, says Turner, presents the following problem: ". . . . there is a vast difference between the concept of standards as applicable to a field, such as medical education and practice, and that of standardization, which in these days may rapidly relegate the concept of a fixed standard to obsolescence."

From the foregoing, it appears that while the A.D.A. Council should establish basic standards of specialization, there would be a grave danger in propounding regulations and standards which would soon tend to become outdated. Each of the specialty boards must be free to maintain a dynamic set of standards in keeping with requirements and progress in its own field of operation.

An important innovation in certification, and one that could well be the death knell of certain recognized dental specialties and specialty organizations, has been recommended by the A.D.A. Council on Dental Education. This new category seeks to obtain certification by specialty boards of persons not in the exclusive, full-time practice of a specialty. These are to be known as *diplomates*. The term *specialist* is to be applied to those who are certified by their specialty board and who devote their entire professional activities to their specialty, while *diplomates* will be those who are certified but not in exclusive practice.

There are, no doubt, areas of special interest in dental practice in which certificates or diplomas could be granted to persons with special training without affecting the very existence of specialties as such. Certain special areas of practice do not permit exclusive practice because of the lack of demand or because they are intimately related to other phases of dental practice. This does not hold true for such specialties as orthodontics, oral surgery, periodontics, and perhaps one or two others.

It should be kept in mind that excessive regulation of specialties can be just as dangerous to dentistry as failure to regulate altogether. The efforts of the A.D.A. Council deserve our wholehearted support. Some existing boards have much to offer because of their years of experience. The cooperative efforts of these boards and of the Council is necessary if the interests of the public and of the profession are to be served.

J. A. S.

Report

REPORT OF THE PUBLIC HEALTH COMMITTEE, AMERICAN ASSOCIATION OF ORTHODONTISTS

THE Committee on Public Health has been working in cooperation with Dr. Walter J. Pelton, Dental Director, Chief, Division of Dental Resources, Department of Health, Education, and Welfare, United States Public Health Service, on a survey of orthodontic care. This will be brought to the Board of Directors of the American Association of Orthodontists for their approval when it is ready.

The Committee has asked Dr. David B. Ast, Director of the Bureau of Dentistry of the Department of Health of the State of New York, to assist in a consultative capacity. The Committee requests that the appropriation of $500.00 be continued for the coming fiscal year.

Respectfully submitted,

J. A. Salzmann, Chairman
Oren A. Oliver
Ernest L. Johnson
L. Bodine Higley
Solomon J. Kessler

Department of Orthodontic Abstracts and Reviews

Edited by
DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City.

Abstracts of Papers Presented Before the Research Section of the American Association of Orthodontists, Detroit, Michigan, May 3 to 7, 1959

A Radiographic Cephalometric Evaluation of Skeletal Facial Height in Children With Class II, Division 1 Malocclusion (Angle): By Wm. Ralph Behm, Northwestern University Dental School, Chicago, Illinois.

This study was made to determine the vertical skeletal facial proportions of persons displaying Class II, Division 1 malocclusion. The material used in this investigation was taken from lateral cephalometric radiographs of sixty children, ranging in age from 9 to 16 years, with Class II, Division 1 malocclusion. Only patients whose pretreatment study casts exhibited a Class II molar relation bilaterally by an amount exceeding one-half the width of one cusp and whose arches individually presented no arch length deficiency were selected.

Total anterior face height was the distance from nasion to gnathion, and the distance from sella to gonion was termed *total posterior face height.* These two vertical lines were divided into segments by the horizontal lines representing the nasal line (ANS-PNS) and the occlusal line. The distances from the points where the nasal line intersected the total anterior and posterior facial height lines to nasion and sella were termed *anterior and posterior upper face heights,* respectively. The distances from the nasal line intersections with the total anterior and posterior facial height lines downward to gnathion and gonion were termed *anterior and posterior lower face heights.* The lower face heights were divided into *maxillary and mandibular components* by the occlusal line.

On the basis of the data obtained, the following conclusions may be suggested regarding Class II, Division 1 malocclusion:

1. All linear measurements of anterior facial height are less variable than their counterparts of posterior facial height.
2. All linear measurements of lower face height are more variable than either upper face or total face height measurements.
3. Vertical linear facial measurements in the lower posterior part of the face are the most variable vertical dimensions of the entire facial complex.
4. For a single mean average age group, there is a high degree of homogeneity in the proportional relations within the anterior facial height area and a low degree of homogeneity within the posterior facial height area.
5. With the exception of the proportion between total posterior and total anterior face height, all other posterior to anterior face height proportions are highly variable for a given mean average group.

6. The angle point A-N-point B and the proportion of lower posterior to lower anterior face height are significantly correlated in a negative manner.

7. The angles point A-N-point B and NS-GoGn bear a highly variable relation to each other.

8. The angle NS-GoGn and the proportion of lower posterior to lower anterior face height are significantly correlated in a negative manner.

9. The vertical height of the posterior face appears to be significantly relatively smaller in children with Class II, Division 1 malocclusion than in older persons with excellent occlusion. This may be due to the malocclusion, to the difference in ages between the groups being compared, or to some other human variable not yet investigated.

4801 W. Church St.
Skokie, Ill.

Gross Reactions to the Widening of the Maxillary Dental Arch of the Pig by Splitting the Hard Palate: By Andrew J. Haas, University of Illinois, Chicago, Illinois.

This study was designed to determine whether or not the midpalatal suture could be opened and, if so, to what extent. What would be the effect of such an operation on contiguous oral and nasal structures? Furthermore, what occurs in the mandible coincidentally with the maxillary changes?

Eight 7¾-month-old Duroc-Poland China pigs were used in this twelve-week study. A jackscrew appliance was placed across the palate of six experimental animals, and the screw was opened approximately 1.8 mm. a day over a two- to ten-day period.

Findings of the study were based on (1) serial plaster casts derived from impressions of the mouth, (2) vital staining, (3) serial cephalometric roentgenograms, (4) embedded and sectioned tissue blocks, and (5) photography.

The findings were as follows:

1. There was no evidence of pain associated with tightening of the screw, and, following the initial adjustment, the maxillae offered little resistance to spreading.
2. The midpalatal suture was definitely opened, resulting in widening of the dental arch and nasal cavity.
3. Increases of up to 15 mm. in upper arch width were recorded in less than two weeks; these increments could not possibly be accounted for by tooth movement alone.
4. The buccal inclination of the mandibular teeth increased in the experimental group and showed little change in the control group.
5. Records made during or immediately after the expansion procedure revealed spacing between the central incisors in proportion to the amount of screw adjustment. Later records showed these diastemata to close rapidly.
6. Early opening of the suture was scissorslike in nature, while force continued for a longer period of time produced a more parallel opening.
7. Opening of the intermaxillary suture was accompanied by a rapid formation of new bone which readily took up the alizarin dye.
8. Frontal sections of the maxilla indicated a bending of the alveolar processes and a lowering of the palatal vault in the experimental animals.

9. Serial roentgenograms revealed no change in interconchal width in the control animals, while in the experimental group interconchal dimension increased proportionately to the opening of the midsagittal suture.

The general conclusion that seems to be indicated in this investigation is that the midpalatal suture can be opened to a degree sufficient to cause significant widening of the maxillary dental arch and at the same time increase intranasal capacity.

Hypnotherapy in the Control of Tongue-Thrusting Occurring During Perverted Swallowing: By Carlton Glynn Lambert, College of Dentistry, University of Tennessee, Memphis, Tennessee.

Twelve male and female tongue-thrusters were used to test the efficacy of hypnotherapy in the control and management of the tongue-thrusting habit. No attempt was made at selection as to sex, age, or ability to enter into the mental state of hypnosis. The only requirement for the patient was that he be amenable to the use of the psychosomatic therapy.

By use of an eye-fixation method of induction, the hypnotic state was established at the first session or as soon as possible thereafter, and the therapeutic training was given immediately. Ten out of the twelve were able to arrest the perverted thrust of the tongue. Two of the patients were listed as failures.

Following the establishment of the altered manner of swallowing from the perverted to the normal, the patients were reinducted into the hypnotic state at regular intervals for the purpose of fortifying the original successful results. An average of ten additional sessions were allotted to each successfully treated patient for this purpose.

No study was made of the efficacy or necessity of the fortification procedure used. The additional appointments given to each patient with an arrested tongue-thrust habit were based on experience with the use of hypnotherapy for other professional purposes.

SCOTTSVILLE, KY.

The Comparative Merits of Cementing Orthodontic Bands on Non-dehydrated and Air-Dried Teeth: A Clinical Study: By John Taggart Ziegler, University of Tennessee College of Dentistry, Memphis, Tennessee.

The purpose of this investigation was to examine the comparative merit of cementing orthodontic bands on nondehydrated teeth and on air-dried teeth. There were two questions to be answered: (1) Did more decalcification occur in vivo on the mesial, distal, buccal, and lingual enamel surfaces, at the edges and under the bands of the experimental or control teeth? (2) Was retention of the band affected when it was cemented to the nondehydrated tooth and subjected to orthodontic forces?

Twenty-five children, eleven boys and fourteen girls, ranging in age from 10 years to 15 years 9 months, were selected from a group of patients initiating orthodontic treatment.

The teeth of patients in this group that were to be banded were selected for study in this investigation. A total of 172 teeth were closely observed in this study. Eighty-five of these teeth were dehydrated with air prior to band cementation; the remaining eighty-seven teeth were not dehydrated before band cementation. The dehydrated teeth were designated the control

group; the nondehydrated teeth were designated the experimental group. Each tooth in the experimental group was matched with its counterpart in the same arch which served as the control.

In so far as adhesion of orthodontic bands to teeth and decalcification of enamel occurring under and/or at the edges of orthodontic bands are concerned, this investigation revealed no statistical difference in the two methods of band cementation employed, that is, dehydrating the tooth before cementation and not dehydrating it.

125 W. Louther St.
Carlisle, Pa.

A Preliminary Study of an Orthodontic Torquing Mechanism: By Edward I. Wolf, University of Kansas City School of Dentistry, Kansas City, Missouri.

A problem that often confronts the orthodontist upon completion of orthodontic treatment is the appearance of lingually inclined crowns of the maxillary anterior teeth. The correction of this condition is of prime importance.

A preliminary study of an orthodontic torquing mechanism was conducted to evaluate the mechanism's clinical usefulness. The evaluation was based on clinical and cephalometric observations.

The two cases subjected to examination were near completion and exhibited central incisor crowns that appeared clinically to be in a lingual axial inclination. The author attempted to correct this condition by using an extraoral appliance that would act upon a torqued arch wire to increase the force exerted by that wire when engaged in the brackets of the central incisors. The extraoral forces were supplied by a headcap and a traction bar.

Treatment time with the appliance was eight weeks. A study of the serial tracings revealed that apparently the teeth responded to the applied stress. The long axis of the central incisors was oriented to sella-nasion and a 2 to 3 degree change in the axial inclination of these teeth was observed.

The author believes that further investigation should be conducted with the apparatus, applied at a different phase of treatment. It is felt that the appliance should be used when the anterior teeth are in an upright position and not after they have been inclined lingually. Because of the type of tooth movement observed, it is believed that the appliance may help the operator keep the anterior teth upright in their posterior bodily movement.

237 Gypsy Lane
Youngstown, Ohio

Serial Dentition and Apical Base Relationships in Class I Malocclusion: By Alan L. Gans, University of Michigan, Ann Arbor, Michigan.

Serial dental casts of fifteen boys and fifteen girls at Hellman's stages IIA, IIIA, and IIIC were studied to determine the dimensions and changes of the dental arches and apical bases in Class I malocclusion. Measurements were derived from oriented radiographs of the casts on which landmarks were indicated by metallic markers. All measurements were subjected to statistical analysis. Significant sex and developmental differences were exhibited in the widths, lengths, and perimeters of the dental arches and apical bases.

The findings of this study were compared to those for normal occlusion, as recorded by Loper, and the differences were tested for statistical significance. In general, all dimensions were slightly larger for normal occlusion.

The pattern of developmental changes was similar, although in normal occlusion dimensional increases were usually greater and decreases smaller than in Class I malocclusion. Tooth size differences were insignificant.

124 Everit St.
New Haven, Conn.

A Quantitative Approach to the Study of Pressure Phenomena in Living Bone: By Richard C. Cushing, Harvard University and Children's Hospital, Boston, Massachusetts.

A method is described in which, by employing tiny Alnico V magnets, pressure applied in vivo can be accurately determined. The tissue reaction to the magnetic alloy is prevented by sandwiching the magnets between acrylic sheets of uniform known thickness and sealing them in with cold-cure acrylic. A plot of the force of attraction between two magnets at varying distances is obtained from measurements made on a special beam balance. The area of the opposing surfaces of the two magnets is measured, and thus the pressure (force per unit area) can be calculated for varying experimental conditions where the magnets are separated by gaps of known distance.

The magnets were placed opposite each other on the internal and external surfaces of the parietal bones and scapulae of adult white rats. Comparable blocks of acrylic were used as controls. The animals were sacrificed at weekly intervals up to three weeks. The parietal bones and scapulae were removed and histologic slides were made of the experimental area. Exact measurements were made microscopically of the thicknesses of bone between the magnets, and the magnitude of the pressure was calculated. Preliminary observations on these preparations were presented.

300 Longwood Ave.
Boston, Mass.

Cleft Palate—Deficiency or Displacement of Tissue: By T. B. Coupe and J. Daniel Subtelny, Department of Orthodontics, Eastman Dental Dispensary, Rochester, New York.

One of the fundamental problems that arise in the diagnosis of cleft palate patients is that of ascertaining whether we are dealing with a deficiency or a displacement of tissue or a combination of both factors. Frontal laminagraphs, obtained in the area of the most inferior point of the zygomaticomaxillary suture, were studied in an attempt to find out whether or not either of the above factors consistently presented itself in conjunction with a given type of cleft palate.

Radiographic registrations were obtained on 107 cleft palate subjects aged 3 years and under. Radiographic registrations were also obtained on a control sample of fifty non-cleft palate subjects aged 3 years and under. These radiographs and tracings were part of a study previously conducted by Subtelny at the Cleft Palate Center of the University of Illinois. The cleft palate subjects were categorized into groups according to the type of cleft exhibited. The films were traced, and measurements were made and averaged.

To date, averaged linear measurements of the palatal shelf, as measured from its medial termination to the lateral margin of the nasal cavity, indicate that there may be a deficiency of tissue which varies according to the type of cleft. There seemed to be a greater deficiency in bilateral cleft types than in posterior cleft types. The unilateral cleft cases exhibited the least degree of deficiency. Displacement was also evident. The dimension between the

lateral limits of the nasal cavity was measured to determine whether or not displacement of the maxillae was evident. Bilateral cleft cases presented the greatest degree of displacement, followed by the unilateral and then the posterior cleft types.

A Comparison of the Rest Vertical Dimension of the Face as Determined Clinically and Electromyographically: By Mark Roberts, Toronto, Ontario, Canada.

This investigation utilized the electromyograph in conjunction with the electronic integrator and the crystograph unit to evaluate quantitatively the activity of the temporal and masseter muscles. While minimum electrical activity was recorded from these muscles, and oriented cephalometric radiograph was taken. This represented the rest vertical dimension of the face.

Twelve edentulous patients were used in this study. The rest vertical dimension of the face was established for these patients by means of (1) clinical procedures, (2) the electromyograph in conjunction with the electronic integrator, and (3) the electromyograph in conjunction with the crystograph unit. In each case the rest vertical dimension of the face was recorded on a lateral cephalometric radiograph.

From the results of this study, the following conclusions were made:

1. A difference was noted to exist between the rest vertical dimension of the face established clinically and the rest vertical dimension of the face established electromyographically.
2. The use of the electronic integrator was found to be a more objective method of measuring the total electrical output of the mandibular musculature than was the crystograph unit.
3. There was no significant difference between rest vertical dimensions of the face established in and out of the cephalostat.

38 Fairleigh Cres.
Toronto, Ontario.

An Electromyographic Analysis of the Temporalis Muscle and Some of the Facial Muscles in Thumb- and Finger-Suckers: By Claude Baril, University of Michigan, Ann Arbor, Michigan.

This study was done on a sample of twenty-four patients who had, or have had in the last six months, active sucking habits. Previous to the electromyographic analysis, a record of the pressure developed by these patients during sucking was taken with a strain-gauge analyzer. A cast and cephalometric analysis was also done.

The relationship between the muscles during different activities, such as tapping, biting hard, swallowing, and sucking, and in the postural position was studied. An attempt to correlate muscle behavior and pressure, Angle classification, overjet, overbite, freeway space area, and Jenkins' cephalometric analysis was also made.

The musculature does not behave as might be expected among such patients. The mentalis and orbicularis oris contraction patterns were surprisingly strong, whereas the contraction patterns from the buccal wall were very weak.

524 West Liberty St.
Ann Arbor, Mich.

News and Notes

American Association of Orthodontists

The fifty-sixth annual session of the American Association of Orthodontists will be held April 24 to 28, 1960, at the Shoreham Hotel in Washington, D. C.

The motif of the meeting will be international. There is no better setting for an "international meeting of minds" than our nation's capital. Washington is truly one

The Shoreham Hotel in Washington, D. C. where the American Association of Orthodontists will hold its next annual meeting, April 24 to 28, 1960.

of the most beautiful cities in the world. Little did the young Frenchman, Pierre Charles L'Enfant, realize that his pencil sketches of the projected capital of a young nation would someday achieve a reality beyond his fondest hopes and dreams to become the "mecca" for world leaders in every field.

Five of nine essayists are eminent orthodontists from Australia, Europe, and South America. You won't want to miss the lectures by C. P. Adams of Belfast, Ireland; P. Raymond Begg of Adelaide, Australia; Newton de Castro of Rio de Janeiro, Brazil;

Anders Lundstrom of Stockholm, Sweden; and Kaare Reitan of Oslo, Norway. These leaders of the orthodontic profession from abroad will be joined by Oren Oliver and Charles Tweed, both of whom will present essays. The first annual Mershon Lecture will be given by C. Edward Martinek. This has been made possible by a trust fund in honor of Dr. Mershon, created for the A.A.O. by the late Mrs. Mershon. Robert Ricketts will present a condensed version of his A.B.O. thesis. The limited-attendance clinics and the general clinics will provide an opportunity to spend more time with these men, as well as with other outstanding orthodontists from here and abroad. An interesting round-table luncheon is being arranged.

Hotel facilities are unusually fine. Because of the expected large attendance, arrangements have been made with the Sheraton-Park Hotel, just one block away, for those who may not be able to obtain reservations at the Shoreham. Reservation cards will be mailed to you for your convenience this month. In keeping with the importance of this meeting, and in order to permit you to gain the most possible from each contribution, it is hoped that arrangements can be completed for closed-circuit television to augment the usual channels of communication.

For a profitable, educational, and pleasant social experience, make your plans now to attend the 1960 meeting!

GEORGE M. ANDERSON, *President*
T. H. GRABER, *General Chairman*
B. EDWIN ERIKSON, *Vice-Chairman*
PAUL V. REID, *Program Chairman*
PAUL HOFFMAN, *Local Arrangements Chairman*
STEPHEN C. HOPKINS, SR., *International Relations*

American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Shoreham Hotel in Washington, D. C., Monday, April 18, through Saturday, April 23, 1960. Orthodontists who desire to be certified by the Board may obtain application blanks from the Secretary, Dr. Wendell L. Wylie, University of California School of Dentistry, The Medical Center, San Francisco 22, California.

Applications for acceptance at the Washington, D. C., meeting, leading to stipulation of examination requirements for the following year, must be filed before March 1, 1960. To be eligible, an applicant must have been an *active* member of the American Association of Orthodontists for at least two years.

American Association of Orthodontists
Registration of Nonmembers for Attendance at Annual Sessions

To ensure full participation of all active members of the American Association of Orthodontists, the following calssification of nonmembers eligible to attend and schedule of attendance fees, which will be charged at the time of registration, has been set up for the coming annual session of the Association at the Shoreham Hotel, Washington, D. C., April 24 to 28, 1960.

A. *No Attendance Fee.*

1. Full-time teachers in university dental schools.
2. Full-time graduate or postgraduate students in university orthodontic departments. It will be necessary to present a letter from the dean of the school certifying the status of the student.
3. Dentists from outside Canada or the United States of America who are members of recognized dental or orthodontic organizations.

B. *Attendance Fee—$10.00.*

1. Associate or junior members of constituent societies of the American Association of Orthodontists.
2. Recent graduates of university orthodontic departments who are in Government Service.

C. *Attendance Fee—$20.00.*

1. Recent graduates of university orthodontic departments who are not members of constituent societies of the American Association of Orthodontists.
2. Other guests.

Those persons who would be classified under the heading of C-1 or C-2 above are required to apply to the chairman of the Credentials Committee at least sixty days before the session for proper forms, which will require (a) written endorsement by two active members of the A. A. O. in the applicant's vicinity, (b) that the applicant be a member in good standing of the American Dental Association, and (c) that the applicant never has been rejected for membership in any of the constituent societies of the A. A. O.

Those persons who would be classified under the headings of A or B would be required only to submit credentials identifying themselves as being in one of these categories at the time of registration. Advanced reservations, which are by far most desirable, can be applied for by clearing one's credentials with the Credentials Committee by March 1, 1960.

Registration under categories C-1 and C-2 will, of necessity, be limited.

Daniel E. Shehan, Chairman
Credentials Committee
619 Medical Arts Bldg.
Baltimore 1, Maryland

Pacific Coast Society of Orthodontists

Headliner for the 1960 meeting of the Pacific Coast Society, Palo Alto, will be Dr. Samuel Pruzansky. The meeting will be held February 21 to 24 in Palo Alto, California.

In addition to Dr. Pruzansky, Program Chairman Eugene E. West has announced that Dr. Carl Ellertson, pedodontist from Palo Alto and a diplomate of the American Board of Pedodontics, will present a paper dealing with observations made by pedodontists and their patients of the orthodontist and his practice.

Central Section of American Association of Orthodontists

The following officers were elected at the twenty-second annual meeting of the Central Section of the American Association of Orthodontists, held Sept. 28 and 29, 1959, at the Sheraton Hotel in Chicago, Illinois:

President—Leo B. Lundergan, St. Louis, Missouri.
President-Elect—Henry E. Colby, Minneapolis, Minnesota.
Vice-President—Elmer F. Bay, Omaha, Nebraska.
Secretary-Treasurer—Kenneth E. Holland, Lincoln, Nebraska.
Director—Elmer F. Bay, Omaha, Nebraska.
Sectional Editor—Charles R. Baker, Evanston, Illinois.

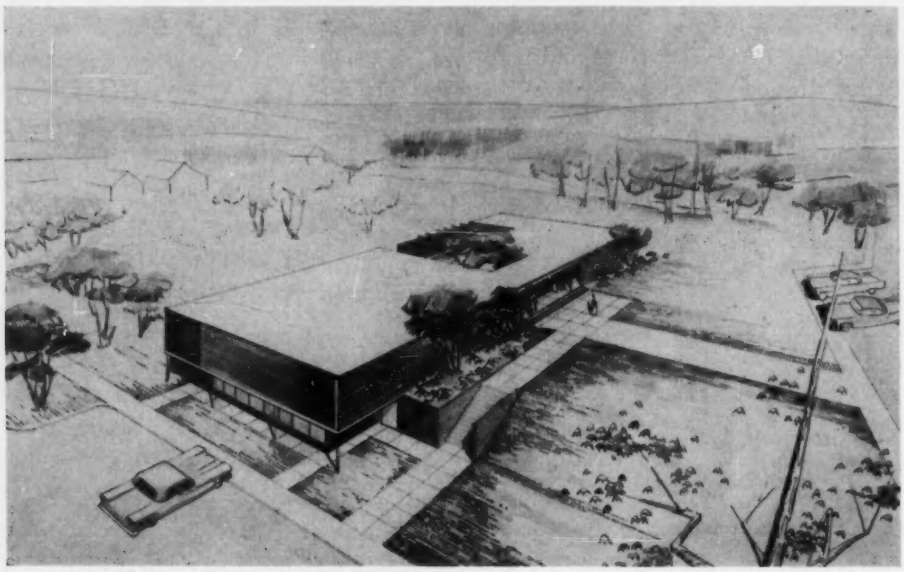
The next meeting of the Central Section will be held Sept. 18, 19, and 20, 1960, in St. Louis, Missouri.

Kansas and Oklahoma Orthodontists Relax at Outing

The Kansas Orthodontic Society served as hosts for a joint meeting with the Oklahoma Orthodontic Society on Sunday and Monday, June 7 and 8, 1959, at the Western Hills Lodge in Sequoyah State Park, Wagoner, Oklahoma.

This annual meeting, which features a long week-end outing and a short orthodontic program, is growing so popular that plans have already been made for another outing in June, 1960. This get-together gives the Kansas and Oklahoma orthodontists an opportunity for a short break in office routine and a period of relaxation. Many orthodontists bring their families and arrive a few days early in order to participate in the activities of the Lodge, which include horseback riding, boating, and water-skiing. Coming as it does at the close of the school year, the meeting receives enthusiastic support from the children.

Greetings and the social hour took place late Sunday afternoon. Then followed an early dinner, after which the first scientific session convened. Sunday evening dinner for the children was served on the patio and was a big hit. The second scientific session began at breakfast on Monday morning and continued until adjournment at lunchtime.



Merrifield doctors' center, Ponca City, Oklahoma.

The Sunday evening program was given by William M. Lathrop of Norton, Kansas, who presented an outstanding outline covering the fundamentals of cephalometrics. Dr. Lathrop, who was highly complimented for the excellent manner in which he presented his subject, gave each member a well-prepared brochure covering his entire outline.

The Monday morning program was given by L. Levern Merrifield of Ponca City, Oklahoma. He described his method of taking and developing x-rays, standardizing techniques, materials, tracings, etc. The procedure that he has developed is comprehensive, thorough, complete, and practical in the coverage of this phase of the study of cephalometrics. (Earlier this year the Oklahoma Orthodontic Society had the privilege of attending an open house in the new Doctor's Building in Ponca City, in which Dr. Merrifield and his physician brother have made arrangements for the practical and efficient utilization of their procedures.)

At this year's meeting, we were honored by the presence of a guest—Dr. Marcus Murphey of Houston, Texas.

The following orthodontists from Kansas were present: William M. Lathrop, W. G. Kennard, John H. Rogers, Gordon L. Teall, Joe Casper, George C. Cox, Clyde F. Schuman, H. E. Thompson, Victor Benton, Dick Rodke, Howard H. Dukes (secretary), Robert Morrison, Leo A. Rogers (president), and John W. Richmond.

Oklahoma orthodontists at the meeting included James Torscha, Stan Pastor, Marion A. Flesher, George E. Mindeman (secretary), Hugh A. Sims, James D. Hall, Earl R. Cunningham, Fred W. Sims, Dow Miller, George R. Webber (president), Joe Hardin, R. Phil Caudle, Harold S. Born, L. Levern Merrifield, Robert H. Knarr, William N. Flesher, W. E. Flesher, and Harry H. Sorrels.

Newly elected officers of the Oklahoma Orthodontic Society are as follows:

President: Robert H. Knarr, Tulsa
President-Elect: George Mindeman, Tulsa
Secretary: William N. Flesher, Oklahoma City

Veterans Administration Medical Teaching Group Hospital

The Veterans Administration Medical Teaching Group Hospital of Memphis, Tennessee, announces that one rotating dental internship and one residency in prosthodontia will be available for the year beginning July 1, 1960. Information and application forms may be obtained from Chief, Dental Service, Veterans Administration Medical Teaching Group Hospital, Memphis, Tennessee.

American Dental Association*

DR. PAUL H. JESERICH, ANN ARBOR, MICH., ASSUMES PRESIDENCY FOR 1959-60; DR. CHARLES H. PATTON, PHILADELPHIA, WINS CONTEST FOR PRESIDENT-ELECT; RECORD-BREAKING 35,200 ATTEND CENTENNIAL SESSION IN NEW YORK CITY

Dr. Paul H. Jeserich, Ann Arbor, dean of University of Michigan School of Dentistry, has assumed the A.D.A. presidency for 1959-60. He took office just before the House of Delegates adjourned at the centennial session held Sept. 14-18 in New York. Dr. Jeserich, who succeeded Dr. Percy T. Phillips, New York, will lead organized dentistry in the U. S. during the first year of its second century. Dr. Charles H. Patton, Philadelphia, was victor in the contest for president-elect, defeating Dr. Edward R. White, Jersey City, N. J., by a vote of 291 to 111. Dr. William A. Fennelly, New York, who served as chairman of the general committee on local arrangements for the session, was named by acclamation to serve as first vice-president. He succeeds Dr. P. Earle Williams, Dallas. Dr. Gordon L. Teall, Hiawatha, Kan., was elected second vice-president, defeating Dr. Fred S. Shandley, Seattle, by a 245 to 153 vote. Dr. Teall's predecessor was Dr. James E. John, Roanoke, Va. The new third vice-president is Dr. Raymond A. Hart, Saginaw, Mich., who succeeds Dr. Walter E. Dundon, Chicago. Dr. Hart defeated Dr. Curtiss W. Schantz, rear admiral, USN, in election for the post by a vote of 199 to 185. Re-elected to his fifth straight term as Speaker of the House of Delegates was Dr. Gerald D. Timmons, Philadelphia.

ARRANGEMENTS COMMITTEE NAMED FOR 1960 ANNUAL SESSION

Dr. John B. Wilson, San Marino, Calif., has been appointed chairman of the general committee on local arrangements for the 1960 annual session being held Oct. 17-20 in Los Angeles. Dr. Bruce R. Kurtz, Pasadena, is vice chairman of the committee and Dr. James P. Bowers, Monrovia, secretary. Dr. Howard V. Jones will serve as chairman of the committee on clinics and motion pictures and be assisted by Dr. Leonard L. McEvoy, vice chairman. Both are from Hollywood. Heading the committee on entertainment and social events is Dr. J. Lorenz, Jones, chairman. Dr. Charles L. Pincus is vice chairman. Both are Beverly Hills doctors. Dr. John P. Frush, San Marino, has been named chairman of the committee on information services. Vice chairman is Dr. C. Albert Moss, Arcadia. Other committees include: *publicity*—Dr. Clarence D. Honig, Beverly Hills, chairman, and Dr. Robert M. Ricketts, Pacific Palisades, vice chairman; *reception*—Dr. Carl W. Rasmussen, Los Angeles, chairman, and Dr. Hugo M. Kulstad, Bakersfield, vice chairman; *women's activities*—Dr. Arthur E. Aull, Jr., Huntington Park, chairman, and Dr. Carlton H. Williams, San Diago,

*Excerpts from the A.D.A. *News Letter*, Sept. 30, 1959.

vice chairman; and *women's entertainment*—Mrs. Cecil W. Neff, San Diego, chairman, and Mrs. Otis O. Rich, Rolling Hills, vice chairman.

SPECIALIZATION DEFINED AS REQUIRING "FULL-TIME"

House action resulted in changes in the Association's Bylaws which give the Council on Dental Education: (1) specific responsibility for recommending the special areas of practice that are to be recognized by the Association and (2) added responsibilities and authority in the supervision of the national certifying boards for these special areas of practice. Through its approval of a statement of policy on specialists and specialties, the House gave new meaning to the term "specialist" by defining specialization as demanding full-time or exclusive practice. Delegates also approved new sets of standards for the operation and conduct of the national certifying boards, which are subject to approval by A.D.A. By resolution, the Association also agreed to encourage dental schools to provide advance courses and programs in all areas of dental practice, including not only those which currently are recognized but also those which are not.

Rocky Mountain Society of Orthodontists

The Rocky Mountain Society of Orthodontists held its thirty-ninth annual meeting at the Aspen Meadows in Aspen, Colorado, Sept. 13 to 16, 1959.

Before reporting on the scientific program, it may be well to describe the setting in which the meeting was held. The town of Aspen, an abandoned mining town until its revival a few years ago, is approximately 8,000 feet in altitude. The Continental Divide is in plain sight, with the snow-capped Maroon Bells reaching into the clouds. Beautiful Mt. Sopris stands to the north. This was truly an inspiring setting in which to hold a meeting. Aspen, as you know, is a world-famous ski resort, bustling with winter sports activities during the winter season. Our meetings were held in the Aspen Institute Building, center of the summer operations. This building is devoted principally to the Aspen Institute for Humanistic Studies. Conferences of such groups as the American Institute of Architecture, the National Medical Advisory Board, and others of equal importance have been held here. Appearing before the Institute, to mention a few, have been Mortimer J. Adler, Hon. Hugo Black of the Supreme Court, Dr. Karl Menninger, Clare Booth Luce, and Mark Van Doren. The annual Music Festival attracts the finest in that line from many parts of the world. This is truly a cultural center. The Health Center is also a fine adjunct to the Institute and was put to good use by our members.

Our essayists and clinicians maintained a splendid program for three days. Dr. Cecil Steiner, of Beverly Hills, California, with his contagious enthusiasm for cephalometrics, made believers out of unbelievers and held our attention throughout his presentation.

Dr. William L. Wilson, of Worcester, Massachusetts, with his superb diction (and it was perfect) demonstrated that there are many ways to correct malocclusion. He presented dozens of cases in all classifications and showed nearly perfect results. These cases were treated with a minimum of appliances—usually upper molar and lateral bands and labial arch and, for the lower arch, molar bands and lingual arch with the lower incisors and cuspids sometimes being banded. Dr. Wilson accomplishes his results with little effort. After seeing the work of an artist such as Dr. Wilson, one cannot look at his own appliance and honestly say: "This is the only way."

Our own member, Dr. Elbert W. King, of Albuquerque, gave an excellent presentation on "Timing Treatment in Class II, Division 1 Malocclusions." He showed the growth taking place during the interval from deciduous to permanent dentition. This was demonstrated graphically with cephalometric x-rays.

Our president, Howard Wilson, and our Board of Directors showed good judgment in arranging such a fine program and received our heartfelt thanks.

The following officers were elected for the coming year:

President—William A. Blueher, 801 Encino Pl., Albuquerque, New Mexico.

President-Elect—H. Carlyle Pollock, Jr., 915 S. Colorado Blvd., Denver, Colorado.
Vice-President—Louis J. Williams, 843 S. Center, Casper, Wyoming.
Secretary-Treasurer—Eli H. Mullinax, 8790 W. Colfax, Lakewood, Colorado.
Editor—Oliver H. Devitt, 523 Republic Bldg., Denver, Colorado.
Assistant Editor—George H. Siersma, 1232 Republic Bldg., Denver, Colorado.
Delegate—Ernest T. Klein, 707 Republic Bldg., Denver, Colorado.
Alternate Delegate—J. Lyndon Carmon, 501 Republic Bldg., Denver, Colorado.

The next meeting will be held at Bishops Lodge in Santa Fe, New Mexico, Sept. 25 to 28, 1960.

Dutch Society for the Study of Orthodontics

The Dutch Society for the Study of Orthodontics is organizing a second "Orthodontic Course of Study" to be held in Leiden during the last week of April, 1960. The program will consist of lectures and demonstrations devoted entirely to subjects connected with general practice. As in 1955, these lectures and demonstrations will be given at Leiden in the University's Anatomical Institute. Since participants are concerned with a course of study, no festivities will take place.

It is hoped that arrangements can be made for the accommodation of all participants in one and the same hotel at Noordwijk aan Zee.

Death of Benno E. Lischer

It is with regret that the JOURNAL reports the death on Oct. 9, 1959, of Dr. Benno E. Lischer. Dr. Lischer was a past-president of the American Association of Orthodontists and the author of many contributions to the orthodontic literature. In 1926 he translated Dr. Paul Simon's *Diagnosis of Dental Anomalies* (published by the Stratford Company, Boston) from German to English.

Notes of Interest

John H. Byrne, D.D.S., and Robert C. Byrne, D.D.S., announce the removal of their offices to St. Louis Hills Medical Center, 6500 Chippewa St., St. Louis, Missouri, practice limited to orthodontics.

G. Vernon Fisk, D.D.S., and Ross O. Fisk, D.D.S., M.S., announce the new location of their practice at 302 North Toronto Medical Bldg., Lawrence Avenue at Avenue Road, Toronto, Ontario, practice limited to orthodontics.

George T. Gildea, D.M.D., and Joseph E. Kelly, D.M.D., wish to announce their association in practice at 1058 North Main St., Brockton, Massachusetts, and 2081 Centre St., West Roxbury, Massachusetts, practice limited to orthodontics.

George H. Grover, D.D.S., and William H. Day, D.D.S., M.S.D., announce their association for the practice of orthodontics exclusively at 450 Sutter, San Francisco, California.

Harold Lesk, D.D.S., announces the opening of his office at 60-04 Junction Blvd., Rego Park 73, New York, practice limited to orthodontics.

Melvin W. Stern, B.S., D.D.S., announces the opening of his office for the exclusive practice of orthodontics at 32 Walpole St., Norwood, Massachusetts.

Dr. R. W. Weinshenker announces the removal of his office to Suite 404 at the same address, 240 South La Cienega Blvd., Beverly Hills, California, practice limited to orthodontics.

Forthcoming meetings of the American Association of Orthodontists:
1960—Shoreham Hotel, Washington, D. C., April 24 to 28.
1961—Denver, Colorado.
1962—Los Angeles, California.
1963—American Hotel, Miami Beach, Florida.

OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and its component societies. The Editorial Board of the JOURNAL is composed of a representative of each of the component societies.

American Association of Orthodontists

(Next meeting April 24-28, 1960, Washington)

President, George M. Anderson - - - - - - - - - - - - - 3700 N. Charles St., Baltimore Md.
President-Elect, William R. Humphrey - - - - - - - - - - - - Republic Bldg., Denver, Colo.
Vice-President, Frank A. Heimlich - - - - - - - - 1824 State St., Santa Barbara, Calif.
Secretary, Earl E. Shepard - - - - - - - - - - - - - - 8230 Forsyth, St. Louis, Mo.

Central Section of the American Association of Orthodontists

(Next meeting Sept. 18-20, 1960, St. Louis)

President, Leo B. Lundergan - - - - - - - - - - 8000 Bonhomme Ave., St. Louis, Mo.
Secretary-Treasurer, Kenneth E. Holland - - - - - - - 1019 Sharp Bldg., Lincoln, Neb.
Director, Elmer F. Bay - - - - - - - - - - - - 216 Medical Arts Bldg., Omaha, Neb.

Great Lakes Society of Orthodontists

(Next meeting Nov. 29-Dec. 2, 1959, Cleveland)

President, Richard C. Beatty - - - - - - - - - - - - 1140 Hanna Bldg., Cleveland, Ohio
Secretary, D. C. Miller - - - - - - - - - - - - - 40 South Third St., Columbus, Ohio
Director, Harlow L. Shehan - - - - - - - 601 Jackson City Bank Bldg., Jackson, Mich.

Middle Atlantic Society of Orthodontists

President, Stephen C. Hopkins, Sr. - - - - - 1746 K St., N. W., Washington, D. C.
Secretary-Treasurer, Charles S. Jonas - - - - - - Mayfair Apts., Atlantic City, N. J.
Director, B. Edwin Erikson - - - - - 3726 Connecticut Ave., N. W., Washington, D. C.

Northeastern Society of Orthodontists

President, Wilbur J. Prezzano - - - - - - - - - Medical Centre, White Plains, N. Y.
Secretary-Treasurer, David Mossberg - - - - - - 36 Central Park S., New York, N. Y.
Director, Norman L. Hillyer - - - - - - - 230 Hilton Ave., Hempstead, L. I., N. Y.

Pacific Coast Society of Orthodontists

(Next meeting Feb. 21-24, 1960, Palo Alto)

President, Richard Railsback - - - - - - - - - 1333 Grand Ave., Piedmont, Calif.
Secretary-Treasurer, Warren Kitchen - - - - - - 2037 Irving St., San Francisco, Calif.
Director, Richard Railsback - - - - - - - - - - 1333 Grand Ave., Piedmont, Calif.

Rocky Mountain Society of Orthodontists

(Next meeting Sept. 25-28, 1960, Santa Fe)

President, William A. Blueher - - - - - - - - 801 Encino Pl., Albuquerque, N. M.
Secretary-Treasurer, E. H. Mullinax - - - - - - - 8790 W. Colfax, Lakewood, Colo.
Director, Ernest T. Klein - - - - - - - - - - - 707 Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, H. Harvey Payne - - - - - - - - - - 60 Fifth St., N.E., Atlanta, Ga.
Secretary-Treasurer, William H. Oliver - - - - - - - 1915 Broadway, Nashville, Tenn.
Director, Boyd W. Tarpley - - - - - - - 2118 Fourteenth Ave., S., Birmingham, Ala.

Southwestern Society of Orthodontists

President, Marcus Murphey - - - - - - - - - - 2017 West Gray, Houston, Texas
Secretary-Treasurer, Harold S. Born - - - - - - 908 S. Johnstone, Bartlesville, Okla.
Director, Nathan Gaston - - - - - - - - - - - - 701 Walnut St., Monroe, La.

American Board of Orthodontics

(Next meeting April 18-23, 1960, Washington)

President, L. Bodine Higley - - - - University of North Carolina, Chapel Hill, N. C.
Vice-President, Jacob A. Salzmann - - - - - - - 654 Madison Ave., New York, N. Y.
Secretary, Wendell L. Wylie - - - - - University of California School of Dentistry, The Medical Center, San Francisco, Calif.
Treasurer, Paul V. Reid - - - - - - - - 1501 Medical Arts Bldg., Philadelphia, Pa.
Director, B. F. Dewel - - - - - - - - - - - - - 708 Church St., Evanston, Ill.
Director, Frank P. Bowyer - - - - - - - - 608 Medical Arts Bldg., Knoxville, Tenn.
Director, Alton W. Moore - University of Washington School of Dentistry, Seattle, Wash.

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By DONALD A. KERR, D.D.S., M.S.; MAJOR M. ASH, JR., D.D.S., M.S.; and H. DEAN MILLARD, D.D.S., M.S. Published January 1959. 419 pages, 6¾" x 9¾", 212 illustrations. Price, $10.00.

2 Goldman-Burket—TREATMENT PLANNING IN THE PRACTICE OF DENTISTRY

This book, the first one to be devoted exclusively to treatment planning, can help you understand the principles of examination on which diagnosis and well organized therapy are completely dependent. You'll find a concise, yet complete list of dental diseases, their signs and symptoms, together with today's most accepted therapeutic measures. For each branch of dentistry, the authors devote a separate chapter to treatment planning in endodontia, operative dentistry, periodontia and complete and partial prosthesis. Particularly outstanding is the chapter on endodontics which describes the various tests commonly used and the chapter on case presentation which contains an intelligent discussion on how to present cases to your patients and how and when to discuss fees and payment plans.

By HENRY M. GOLDMAN, D.M.D.; and LESTER W. BURKET, D.D.S., M.D.; and Staff of the School of Dentistry and Graduate School of Medicine, University of Pennsylvania. Published August 1959. 305 pages, 4⅞" x 7⅝", 82 illustrations, 6 charts. Price, $6.50.

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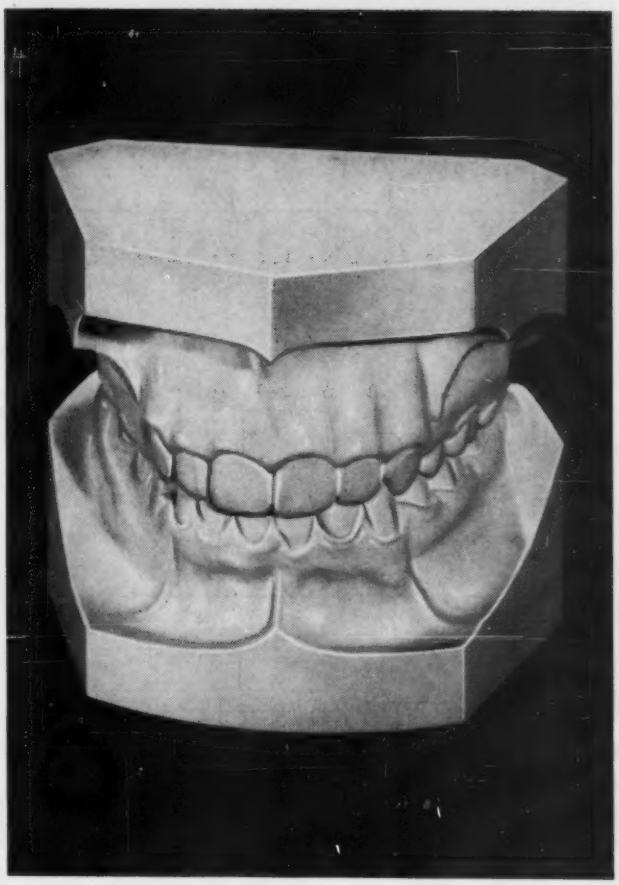

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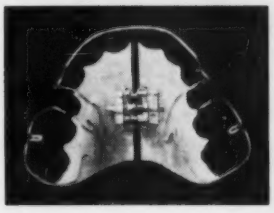

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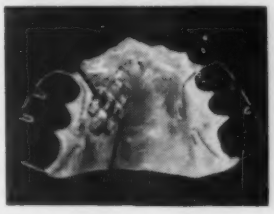
Fig. 2
Upper Appliance with GLENROSS Screw to move 654/ distally



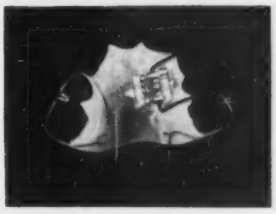


Fig. 3
Upper Appliance with GLENROSS Screw to move /34 labially

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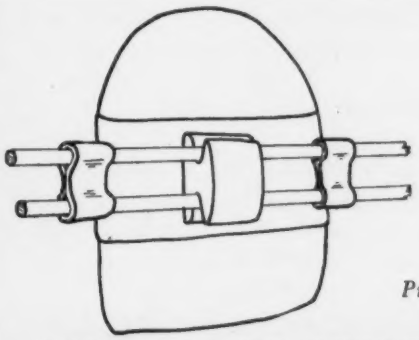

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S.S.White Edgewise Brackets

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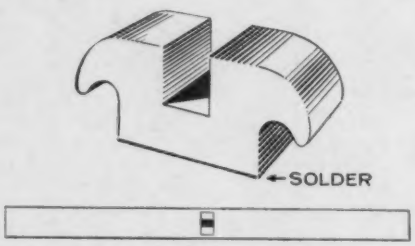
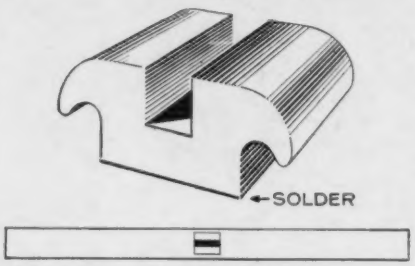


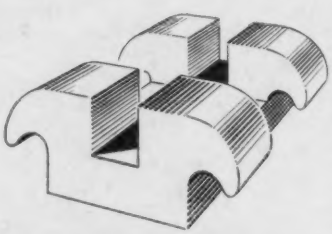
Posterior .100″ wide M 452AS



Pre-soldered Metalba* Edgewise Brackets are strong; remain clean in the mouth; can be soldered to; can be used on precious metal or Stainless Steel bands; and, used over and over again.

Divided Triple-width Edgewise Brackets

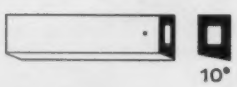
M 455



A convenient bracket for rotations as it provides two anchor points for ligatures. Supplied without solder to permit slight bending if required.

Anchor Tubes

M 474



Metalba* Anchor Tubes for use in connection with Torque Slot Edgewise Brackets. They are ¼ inch long, rectangular tubes, with a bore of .022 x .028. The side of the tube which is to be soldered to the band has a 10 degree angle to permit it to fit into the Torque Slot Bracket assembly.

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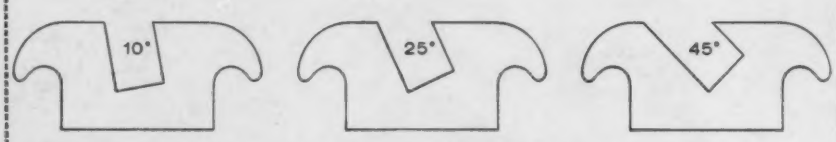
Torque slot, Divided Triple-width Edgewise Brackets



The angle of the wire slot in the Bracket gives direction to the Torque force of arch wire.

M 516	Torque 10°	Width	.140 inches
M 517	Torque 10°	Width	.180 inches
M 518	Torque 25°	Width	.180 inches
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